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UNITED STATES DISTRICT COURT
FOR THE CENTRAL DISTRICT OF CALIFORNIA

THE WISHTOYO FOUNDATION, a non-profit corporation, and VENTURA COASTKEEPER, a program of WISHTOYO FOUNDATION,

Plaintiffs,

v.

ARCTURUS MANUFACTURING CORPORATION, PRECISION CASTPARTS CORP., a corporation, and CARLTON FORGE WORKS, a corporation,

Defendants.

Case No. 2:17-CV-02229-CBM (GJSx)

[Proposed] CONSENT DECREE

(Federal Water Pollution Control Act, 33 U.S.C. §§ 1251 *et seq.*)

WHEREAS, the Wishtoyo Foundation is a 501(c)(3) non-profit corporation organized under the laws of the State of California. The Wishtoyo Foundation's mission is to preserve, protect and restore Chumash culture, the culture and history of first nations peoples, cultural resources, and the environment;

WHEREAS, Ventura Coastkeeper is a program of the Wishtoyo Foundation. Ventura Coastkeeper's mission is to protect, preserve, and restore the ecological integrity and water quality of Ventura County's inland water bodies, coastal waters and watersheds;

WHEREAS, Ventura Coastkeeper and Wishtoyo Foundation are referred to herein as "Wishtoyo" or "Plaintiffs";

WHEREAS, Defendant Arcturus Manufacturing Corporation owns and operates a metal forging and manufacturing facility located at 6001 Arcturus Ave. Oxnard, CA 93033 ("Facility"), Defendant Carlton Forge Works is an affiliated company, and Defendant Precision Castparts Corp. is the direct corporate parent of Arcturus Manufacturing Corporation and Carlton Forge Works. Arcturus Manufacturing Corporation, Carlton Forge Works, and Precision Castparts Corp are hereinafter altogether defined as "Defendants" or "Arcturus.";

WHEREAS, on March 16, 2015, Arcturus filed a Notice of Intent ("Notice of Intent") to comply with the Terms of the General Permit for Storm Water Discharges Associated with Industrial Activities National Pollutant Discharge Elimination System ("NPDES") General Permit No. CAS000001 [State Board] Water Quality Order No. 2014-0057-DWQ ("2015 Permit") for the Facility;

WHEREAS, on January 17, 2017, Wishtoyo issued sixty (60) day notice letters ("Notice Letters") to Defendants, the United States Environmental Protection Agency ("EPA"), EPA Region IX, the State Water Resources Control Board ("State Board") and the Los Angeles Regional Water Quality Control Board ("Regional Board"), stating its intent to file suit for violations of the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251, *et seq.* ("Clean Water Act" or "CWA").

The Notice Letter alleged violations of the Clean Water Act for Defendants' discharges of pollutants into receiving waters in violation of ("NPDES") Industrial General Permit No. CAS000001 [State Board] Water Quality Order No. 97-03-DWQ ("1997 Permit"), as superseded by the 2015 Permit;

WHEREAS, on March 22, 2017, Wishtoyo filed a complaint against Defendants in the United States District Court, Central District of California entitled *Wishtoyo Foundation et al. v. Arcturus Manufacturing., et al. Case No. 2:17-CV-02229-CBM (GJSx)* ("Complaint");

WHEREAS, Arcturus asserts that it ended industrial operations at the Facility on September 30, 2017;

WHEREAS, Arcturus has agreed to close the Facility (ID Number: 56-013-000308) in accordance with the Facility Closure Plan dated October 4, 2017 and approved by the City of Oxnard Fire Department Certified Unified Program Agency ("CUPA") on October 5, 2017 (Exhibit 1, hereinafter "Closure Plan") and in accordance with Cal. Fire Code § 5001.1 *et seq.* and 22 Cal. Code. Regs. ("CCR") §§ 66262.10 *et seq.* and 66265.1 *et seq.*

WHEREAS, Plaintiffs and Defendants (collectively referred to herein as the "Settling Parties" or "Parties") agree that it is in the Parties' mutual interest to enter into a Consent Decree setting forth terms and conditions appropriate to resolving the allegations set forth in the Complaint and the Notice Letters without further proceedings;

WHEREAS, all Defendants' obligations and duties under this Consent Decree are joint and severally owed by each and all of them;

WHEREAS, Defendants deny all allegations of the Complaint and Notice Letter. However, in the spirit of cooperation to settle this matter and to resolve the allegations set forth in the Complaint and Notice Letter without further proceedings, Defendants have compromised, and have agreed to enter into this Consent Decree and to comply with the provisions of this Consent Decree;

WHEREAS, the Settling Parties agree that the Consent Decree is an actual agreement that is the product of good faith, arms-length negotiations;

WHEREAS, it is the express purpose of the Parties entering into this Consent Decree to protect and enhance the water quality of the Ormond Beach Wetlands, Oxnard Drain # 3, Mugu Lagoon, the Pacific Ocean, and within the Pacific Ocean the Southern California Bight and Santa Barbara Channel to which the Ormond Beach and Mugu Lagoon watersheds drain into; to further the objectives set forth in the Clean Water Act; and to resolve those issues alleged by the Plaintiffs in their Complaint and Notice Letters;

WHEREAS, all actions taken by Defendants pursuant to this Consent Decree shall be made in compliance with all applicable federal, state and local rules and regulations;

NOW THEREFORE IT IS HEREBY STIPULATED BETWEEN THE SETTLING PARTIES AND ORDERED AND DECREED BY THE COURT AS FOLLOWS:

1. The Court has jurisdiction over the subject matter of this action pursuant to Section 505(a)(1)(A) of the CWA, 33 U.S.C. § 1365(a)(1)(A);

2. Venue is appropriate in the Central District Court pursuant to Section 505(c)(1) of the CWA, 33 U.S.C. §1365(c)(1), because the Facility at which the alleged violations took place is located within this District;

3. The Complaint and First Amended Complaint state claims upon which relief may be granted against Defendants pursuant to Section 505 of the CWA, 33 U.S.C. § 1365;

4. Plaintiffs have standing to bring this action;

5. The Court shall retain jurisdiction over this matter for purposes of interpreting, modifying or enforcing the terms of this Consent Decree, or as long thereafter as is necessary for the Court to resolve any motion to enforce this Consent Decree.

I. OBJECTIVES

6. It is the express purpose of the Parties entering into this Consent Decree to further the objectives set forth in the Clean Water Act, 33 U.S.C. §§ 1251, *et seq.*, and to resolve those issues alleged by Wishtoyo in its Complaint and Notice Letters without further litigation. In light of these objectives and as set forth fully below, Defendants agree, *inter alia*, to comply with the terms and provisions of this Consent Decree, the applicable provisions of the 2015 Permit, and all applicable provisions of the CWA.

II. EFFECTIVE DATE AND TERMINATION DATE

7. The term "Effective Date," as used in this Consent Decree, shall mean the last day for the United States Department of Justice and the United States Environmental Protection Agency (collectively "Federal Agencies") to comment on the Consent Decree, i.e., the 45th day following the Federal Agencies' receipt of the Consent Decree, or the date on which the Court enters the final Consent Decree, which ever date is later.

8. This Consent Decree will terminate thirty (30) days after Arcturus obtains written approval from the Regional Board of a Notice of Termination under section II.C of the 2015 Permit and after Defendants' have performed their obligations in paragraphs 18, 21, and 22 of this Consent Decree, unless there is a prior ongoing, unresolved dispute regarding Defendants' compliance with the Consent Decree's terms. Should there be such a dispute, the Parties may meet and confer pursuant to paragraph 25 of this Consent Decree in order to attempt to secure an agreement to extend the Termination Date of the Consent Decree via a stipulation that shall be filed with the Court that will dictate the Consent Decree Termination Date and termination terms. In the alternative, the disputing Party, at its discretion without having to meet and confer with the other Parties pursuant to paragraph 26 of this Consent Decree, may file a Notice of Dispute with the Court prior to the Termination Date, which shall identify the issue in dispute. The filing

of such a Notice of Dispute shall extend the Termination Date until the Court determines the dispute has been resolved and thereupon dismisses the case, or, alternatively, if the Settling Parties file a stipulation for dismissal.

III. COMMITMENTS OF THE PARTIES

A. Initial Pollution Control Measures for Stormwater at the Facility Associated with Industrial Operations Discharges ("Stormwater Discharges")

9. The stormwater pollution control measures required by this Consent Decree and the 2015 Permit shall be designed and operated to manage stormwater generated from a 5 year, 24-hour rainfall event recorded by the *National Oceanic and Atmospheric Administration* ("*NOAA*") Oxnard Airport Rainfall gauge ("Design Standard").[1] For the purpose of this Consent Decree, properly documented Stormwater Discharges, in connection with rainfall events in which precipitation exceeds the Design Standard, are not subject to the requirements of this Consent Decree.

10. Defendants shall implement (or in some instances have already implemented) the following Best Management Practices ("BMPs") by the dates set forth below, and, as applicable, as depicted on the site map in Exhibit 2 hereto:

a. Arcturus updated its Storm Water Pollution Prevention Plan ("SWPPP") in June 2017 to reflect its then current operations and BMPs. Arcturus has since ceased all activities at the Facility apart from activities related to its closure.

b. By July 2017, Arcturus removed from the Facility all refractory bricks that it could identify.

c. By July 2017, Arcturus provided information to Wishtoyo concerning the capacity of the cooling water reservoir and the reasons why Arcturus believed that precipitation could not cause the reservoir to

[1] The 5-year 24 hour rainfall event recorded by the NOAA Oxnard Airport Rainfall gauge is 3.56 inches.

overflow.

d. By July 2017, Arcturus removed pooled boiler water that had been identified by Wishtoyo during a site visit and took steps to prevent a recurrence.

e. By July 2017, Arcturus identified pipes running along the southern perimeter of the Facility and confirmed that they did not discharge to the stormwater conveyance system.

f. By July 2017, Arcturus removed a small area of oil stains and absorbent near the oil storage buildings.

g. By July 2017, Arcturus repaired an area of potholed and cracked pavement shown in "photograph 488" taken by Wishtoyo during a site visit.

h. By December 15, 2017, Arcturus will pressure-wash the steam cleaning trench.

i. Arcturus will continue to place Envirosoxx filters on stormwater outfalls DP-1, DP-2, DP-3, DP-4, and DP-8 before predicted rain events. Once the discharge from the rain event has ceased, the filters may be removed until the next predicted rain event in order to prevent them from deteriorating between discharges.

j. All dies will be removed from the Facility by December 31, 2017.

k. Arcturus will continue to place tarps over outside trash and scrap bins before predicted rain events and until the event ends, except when the bins are in active use.

l. Arcturus will continue to clean the inside perimeter of the site monthly to remove trash and debris.

m. Arcturus will continue to conduct any blasting and equipment cleaning within the paved steam cleaning trench area. All wastewater and stormwater generated in this area will be collected and disposed of as

hazardous waste.

For Stormwater Discharges during storms within the Design Standard, if the BMPs set forth in this paragraph do not effectively prevent discharges or reduce contamination in stormwater discharged from the Facility in a manner sufficient to achieve the Consent Decree Standards listed in Table 1 below, Arcturus shall develop and implement additional BMPs pursuant to Paragraph 14 of this Consent Decree to meet the Consent Decree Standards in Table 1 of this Consent Decree.

11. Arcturus shall use the National Oceanic and Atmospheric Administration ("NOAA") Oxnard Airport Rainfall gauge to accurately determine total rainfall at the Facility over 24 hours, or if the NOAA Oxnard Airport Rainfall gauge is not operational, the next closest NOAA Rainfall gauge, and if not NOAA Rainfall gauge is available, the closest Ventura County operated rainfall gauge.

12. Arcturus shall not discharge stormwater or non-storm water that is not authorized by the 2015 Permit to the Facility's storm drains.

B. Reduction of Pollutants in Discharges

13. Consent Decree Standards and Contaminant Reduction. Beginning with the 2017-2018 Wet Season (defined as July 1 to June 30) ("Wet Season"), contaminants in Stormwater Discharges shall be subject to the standards in Table 1[2] ("Consent Decree Standards"). Beginning with the 2017-2018 Wet Season, if a contaminant in a Stormwater Discharge from any discharge point exceeds a Consent Decree Standard(s) in Table 1, Arcturus shall implement an Action Plan pursuant to paragraph 14 of this Consent Decree sufficient to meet the applicable Consent Decree Standard(s).

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[2] The total recoverable Consent Decree Standards in Table 1 are derived from U.S. EPA Benchmarks included in the NPDES Storm Water Multi-Sector General Permit for Industrial Activities ("Multi-Sector Permit"), 65 Federal Register 64839, 64766 (2000); *see also*, Multi-Sector Permit (2008). The dissolved Consent Decree Standards in Table 1 are derived from the Criteria for Priority Toxic Pollutants in the State of California, 40 C.F.R. § 131.38 ("CTR"). The Consent Decree Standard for zinc is hardness-dependent. The total recoverable Consent Decree Standards are expressed in Table 1 using an assumed hardness range of 75-100 mg/l $CaCO_3$. The dissolved Consent Decree Standards are expressed in Table 1 using an assumed hardness range of 75-100 mg/l $CaCO_3$.

Table 1

Contaminant	Consent Decree Standard (All but pH expressed as mg/L; hardness dependent limits in bold)
Total Suspended Solids	100
Oil and grease	15
Total Recoverable Aluminum	0.750
Total Recoverable Iron	1.0
pH	6.5 to 8.5 units
Total Recoverable Zinc	**0.110**
Total Recoverable Copper	**.0123**
Nitrate + Nitrite Nitrogen	0.68

14. **Action Plans for Table 1 Exceedances.** Beginning with the 2017-2018 Wet Season, Arcturus shall submit a plan for reducing and/or eliminating the discharge of pollutants ("Action Plan") if sampling conducted pursuant to paragraph 16 of this Consent Decree demonstrates that the concentration of any Table 1 contaminant in any Stormwater Discharge exceeds the applicable Consent Decree Standard. Arcturus shall submit an Action Plan, if required, no later than August 1 following the Wet Season in which the Table 1 Consent Decree Standard was exceeded. Action Plans are not required for any Consent Decree Standard exceedance in a Stormwater Discharge that is the result of precipitation in excess of the Design Standard.

a. Action Plan Requirements. Action Plans shall include at a minimum: (1) the identification of the pollutant(s) discharged in excess of the Consent Decree Standard, (2) an assessment of the source of each pollutant exceedance of Consent Decree Standards, (3) the identification of additional BMPs, including structural BMPs and/or systems/devices to treat stormwater prior to discharge from the Facility, with demonstrated effectiveness in meeting the applicable Consent Decree Standard, and that will be implemented to reduce and/or eliminate the discharge of pollutants from the Facility so that contaminants in Stormwater Discharges do not exceed the applicable Consent Decree Standard

("Action Plan BMPs"), and (4) time schedules for implementation of the Action Plan BMPs. The time schedule(s) for implementation shall ensure that all Action Plan BMPs are implemented no later than October 1 following the submission of the Action Plan. If Defendants feel it is not feasible to implement Action Plan BMPs by October 1, the Action Plan shall provide a demonstration as to why it is not feasible to implement the BMP by an earlier date and this demonstration shall detail the earliest feasible date the applicable BMP can be implemented ("Demonstration").

b. Action Plan Review. Wishtoyo shall have thirty (30) days upon receipt of Arcturus' Action Plan to provide Arcturus with comments. Within thirty (30) days from the date Wishtoyo comments on Arcturus' Action Plan, Arcturus shall provide Wishtoyo with a written explanation if Arcturus refuses to develop and/or implement any of Wishtoyo's recommended additional BMPs and or refuses to accept and incorporate any of Wishtoyo's comments. If the Action Plan contains a Demonstration, Plaintiffs, upon review of the Demonstration, shall extend the deadline for implementation the applicable BMPs to the earliest date in which implementation is feasible.

c. Any disputes as to the adequacy of the Action Plan shall be resolved pursuant to the dispute resolution provisions of this Consent Decree, set out in Section IV below.

d. Arcturus shall revise the SWPPP to include the Action Plan BMPs by October 1 of the Wet Season following the Wet Season in which the exceedance occurred.

e. Arcturus shall implement any Action Plan BMPs agreed upon by Arcturus and Wishtoyo in accordance with the schedule specified in the Action Plan.

f. If any Action Plan BMP(s) require any agency approval, then Arcturus shall contact Wishtoyo to request an extension of the deadline, if

necessary, to implement the Action Plan BMP(s) requiring agency approval. Wishtoyo's consent to Arcturus' requested extension shall not be unreasonably withheld.

g. Notwithstanding any other provision of this Consent Decree, Arcturus has no further obligation to monitor stormwater discharges, prepare and submit an Action Plan, revise its SWPPP, or otherwise comply with paragraphs 9 through 16 of this Consent Decree after Arcturus obtains written notification from the Regional Board that its coverage under the 2015 Permit is terminated.

C. **Storm Water Pollution Prevention Plan**

15. Additional Revisions to SWPPP. Arcturus shall revise the SWPPP as necessary and appropriate, including but not limited to: (a) each time additional BMPs are developed to achieve compliance with the terms of the Action Plan requirements of paragraph 14 of this Consent Decree and/or the 2015 Permit; and (b) as required by the 2015 Permit, as it may be amended. Arcturus shall submit a revised SWPPP to Wishtoyo for review and comment as soon as it is completed and Wishtoyo may provide comments on the revised SWPPP within thirty (30) days of receipt. Arcturus will consider and respond to Wishtoyo's comments within thirty (30) days of receipt. Any disputes as to the adequacy of any revised SWPPP shall be resolved pursuant to the dispute resolution provisions of this Consent Decree, set out in Section IV below.

D. **Stormwater Sampling and Monitoring at the Facility**

16. Sample Locations, Analysis and Sample Frequency. Arcturus shall collect and analyze stormwater samples as follows:

a. From at least two (2) qualifying storm events per each half of the Reporting Year (July 1 to December 31 and January 1 to June 30), in accordance with Section XI.B of the 2015 Permit, Arcturus shall collect storm water samples at the following locations: DP-1, DP-2, DP-3, DP-4, DP-5, DP-6, DP-7, and DP-8, as depicted in Exhibit 2

hereto in the event that discharges occur at these locations during qualifying storm events. Any failure to collect two (2) samples from each outfall during each of the Reporting Year as required by the 2015 Permit shall be documented, explained, and reported to Wishtoyo within fifteen (15) days after each half of the Reporting Year (*i.e.*, by January 15 and July 15). Arcturus shall analyze the samples for the constituents identified in Table 1.

b. Arcturus shall use a state certified laboratory that adheres to the EPA methods for all sample analysis pursuant to this Consent Decree. Arcturus shall select laboratories and analytical limits such that, at a minimum, the method detection limits are below the Consent Decree Standards in Table 1.

E. Compliance Monitoring and Reporting

17. Annual Site Visits. A Wishtoyo representative, and if Wishtoyo desires up to two additional representatives or consultants (including an attorney), may conduct two site visits each year that this Consent Decree is in effect ("Site Visits"). Site Visits shall occur during normal business hours (7:00 a.m. to 5:00 p.m., Monday through Friday, excluding holidays). Wishtoyo shall provide Arcturus with as much notice as possible, but at a minimum shall provide at least twenty four (24) hours' notice prior to a Site Visit during a wet weather event, and five (5) days' notice prior to a Site Visit during dry weather. Notice will be provided by telephone and electronic mail during normal business hours; effective notice for purposes of this paragraph requires confirmation from Arcturus, which may not be unreasonably withheld, at least twenty four (24) hours before the Site Visit, by e-mail or telephone, that it is aware that Wishtoyo will be conducting a Site Visit. During the Site Visit, Arcturus shall allow Wishtoyo and/or its representatives access to the Facility's SWPPP, the Monitoring and Reporting Plan, monitoring records related to Stormwater Discharges, and to all monitoring reports

and data for the Facility related to Stormwater Discharges. During a wet weather Site Visit, Wishtoyo and/or its representatives may conduct sampling of Stormwater Discharges from the Facility, which can be used for purposes of this Consent Decree—provided that a state certified laboratory that adheres to the EPA methods for all sample analysis is used—to demonstrate that the concentration of any Table 1 contaminant in any Stormwater Discharge exceeds the applicable Consent Decree Standard and thus whether an Action Plan pursuant to paragraph 14 of this Consent Decree is required. If Arcturus elects, Wishtoyo shall provide split samples to Arcturus at the time of collection, and Wishtoyo will provide a copy of all analytical results from the samples, including laboratory reports, to Arcturus within seven (7) days of receiving the results.

18. Wishtoyo's Compliance Monitoring. Arcturus agrees to compensate Plaintiffs for time to be spent monitoring Arcturus' compliance with the Consent Decree. To this end, Arcturus shall pay Wishtoyo the sum of Twenty Five Thousand Dollars ($25,000) to be received within thirty (30) days of the Effective Date for Wishtoyo's efforts to monitor Arcturus' compliance with this Consent Decree. Each year Arcturus is required to submit an Action Plan to Wishtoyo pursuant to paragraph 14 of this Consent Decree, Arcturus shall make a compliance monitoring payment in the amount of Five Thousand Dollars ($5,000) upon submission of the Action Plan. All payments required under this paragraph shall be submitted and made payable to "Wishtoyo Foundation," addressed to Wishtoyo Foundation, 9452 Telephone Rd. #432, Ventura, CA 93004, and sent via courier or overnight delivery.

19. Data Reporting. During the life of this Consent Decree, Arcturus shall provide Wishtoyo with analytical data from sampling conducted pursuant to this Consent Decree within 10 days of Arcturus receiving the analytical results from the laboratory. Upon submitting monitoring data, inspection reports, and laboratory analyses to the State Board or Regional Board pursuant to the 2015 Permit, within 1

business day after such submission(s), Arcturus shall email Wishtoyo copies of such submission(s).

20. Document Provision. During the life of this Consent Decree, Arcturus shall copy Wishtoyo on all formal, written communications Arcturus submits to the Regional Board, the State Board, the CUPA, Ventura County, City of Oxnard, U.S. Environmental Protection Agency, or California Department of Toxic Substances Control regarding stormwater at the Facility, including, but not limited to, Notice of Termination under section II.C of the 2015 Permit. Such communications shall be provided to Wishtoyo concurrently as they are sent to the Regional Board, State Board, CUPA, Ventura County, City of Oxnard, U.S. Environmental Protection Agency, or California Department of Toxic Substances Control. Arcturus shall provide to Wishtoyo any formal, written communications it receives from the Regional Board, State Board, CUPA, Ventura County, City of Oxnard, U.S. Environmental Protection Agency, or California Department of Toxic Substances Control regarding stormwater at the Facility within five (5) business days of receipt by Defendants.

F. Environmental Project, Reimbursement of Litigation Fees and Costs

21. Environmental Project. Defendants agrees to make a payment of Seventy-Five Thousand ($75,000) to be received within thirty (30) days of the Effective Date to Central Coast Alliance United for a Sustainable Economy ("CAUSE") and also a payment of Seventy-Five Thousand Dollars ($75,000) to be received within thirty (30) days of the Effective Date to Multicultural Education for Resources Issues Threatening Oceans Foundation Inc. ("MERITO Foundation Inc.") for projects designed to analyze, reduce, prevent, or otherwise mitigate the ecological effects of stormwater and/or non-stormwater discharges into the Ormond Beach Wetlands, Mugu Lagoon, the Santa Barbara Channel, and or the Southern California Bight. The payment to CAUSE shall be made out to CAUSE and mailed

via certified mail or overnight delivery to the attention of Maricela Morales, Executive Director, 2021 Sperry Ave # 9, Ventura, CA 93003. The payment to MERITO Foundation Inc. shall be made out to MERITO Foundation Inc.[3] and mailed via certified mail or overnight delivery to the attention of Rocio Lozano-Knowlton, Executive Director, 1501 Cardigan Ave., Ventura CA 93004. Defendants shall provide Wishtoyo with a copy of such payments. Defendants shall have no obligation pursuant to this paragraph other than the payment of the stated amounts to the listed recipients by the date specified.

22. Reimbursement of Plaintiffs' Fees and Costs. Defendants agree to partially reimburse Plaintiffs for their investigation fees and costs, consultant fees and costs, reasonable attorneys' fees, and other costs incurred as a result of investigating and filing the lawsuit, and negotiating a resolution of this matter in an amount totaling One Hundred Twenty Six Thousand Five Hundred Dollars ($126,500). All such payments shall be received within thirty (30) days of the Effective Date and shall be made payable to "Law Office of Gideon Kracov," addressed to Gideon Kracov, 801 S. Grand Av., 11th Fl., Los Angeles, CA 90017 and sent via certified mail or overnight delivery.

G. Agency Review of Consent Decree

23. Plaintiffs shall submit this Consent Decree to the Federal Agencies, within seven (7) days of the final signature of the Parties, for Federal Agency review consistent with 40 C.F.R. § 135.5. The agency review period expires forty-five (45) days after receipt by the Federal Agencies, as evidenced by written acknowledgement of receipt by the agencies or delivery confirmation receipts. In the event that the Federal Agencies object to entry of this Consent Decree, the Parties agree to meet and confer to attempt to resolve the issue(s) raised by the Federal Agencies.

[3] MERITO Foundation Inc. is the registered fictitious business name of / doing business as name of: Multicultural Education for Resources Issues Threatening Oceans Foundation Inc.

IV. DISPUTE RESOLUTION

24. This Court shall retain jurisdiction over this matter for the purposes of adjudicating all disputes among the Parties that may arise under the provisions of this Consent Decree. The Court shall have the power to enforce this Consent Decree with all available legal and equitable remedies, including contempt.

25. Meet and Confer. A party to this Consent Decree shall invoke the dispute resolution procedures of this Section by notifying all other Parties in writing of the matter(s) in dispute and of the party's proposal to resolve the dispute under this Section. The Parties shall then meet and confer in an attempt to resolve the dispute no later than fourteen (14) calendar days from the date of the notice.

26. If the Parties cannot resolve a dispute by the end of the meet and confer process, the party initiating the dispute resolution provision may invoke formal dispute resolution by filing a motion before the United States District Court for the Central District of California. The Parties shall jointly apply to the Court for an expedited hearing schedule on the motion.

27. If Wishtoyo initiates a motion or proceeding before the Court to enforce the terms and conditions of this Consent Decree, Wishtoyo shall be entitled to recover reasonable fees and costs incurred to enforce the terms of this Consent Decree consistent with the provisions of Sections 505 and 309 of the CWA, 33 U.S.C. §§ 1365, 1319.

V. MUTUAL GENERAL RELEASE OF LIABILITY AND COVENANT NOT TO SUE

28. The Parties hereby release each other and each of their current, former, and future predecessors-in-interest, successors in interest, parents, ultimate parent companies, directly and indirectly affiliated, joint ventures, partnerships, related companies, subsidiaries and/or affiliates, together with all their current and former respective officers, employees, directors, partners, members, Board of Directors, shareholders, officials, agents, accountants, attorneys, insurance carriers and

reinsurers, sureties, representatives, independent contractors, consultants, advisors, and all successors, assigns and persons/entities in privity with any one or more of such persons/entities, of and from any and all CWA demands, actions, causes of action, suits, obligations, assessments, damages, liabilities, investigation costs, remediation costs, restoration costs, other costs, losses, or expenses (including attorneys' fees and expert witness fees) of any kind or nature whatsoever (whether legal or equitable, past, present or future, ascertained or unascertained, known or unknown, suspected or unsuspected) ("Claims") that have been or could have been asserted up through the Effective Date for or relating to above-ground stormwater run-off, including, but not limited to, claims that were presented or that could have been presented in the Complaint or Notice Letters. However, this general release specifically excludes releasing Defendants from Claims for or relating to the Defendants' failure to comply with this Consent Decree while the Consent Decree is in effect. For purposes of clarification, this general release specifically excludes and does not release Defendants from Claims: (a) for or relating to Defendants' failure to implement or adhere to the Closure Plan to the extent that the Claim is not a CWA Claim for or relating to above-ground stormwater run-off, and (b) for or relating to subsurface soil or groundwater contamination at the Facility or Facility site to the extent that the Claim is not a CWA Claim for or relating to above-ground stormwater run-off.

29. With respect to, and subject to the terms and exclusions of, the general release contained in paragraph 28 above, the Parties expressly waive any rights or benefits available under section 1542 of the California Civil Code, which provides as follows:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.

30. Except as stated in paragraphs 28 and 29, this Consent Decree does not limit Plaintiffs' right to address or take any position that it deems necessary or appropriate in any formal or informal proceeding before the Regional Board, State Board, EPA, state, local, or federal agency, or any other judicial or administrative body on any other matter relating to Defendants, including, without limitation, the Closure Plan or the right to advocate for stricter effluent limits or monitoring requirements in the 2015 Permit when they are reissued, amended, or renewed.

31. Neither the Consent Decree nor any payment pursuant to the Consent Decree shall constitute or be construed as a finding, adjudication, or acknowledgement of any fact, law or liability, nor shall it be construed as an admission of violation of any law, rule, or regulation. Defendants maintain and reserve all defenses it may have to any alleged violations that may be raised in the future.

32. Force Majeure. Defendants shall notify Wishtoyo pursuant to the terms of this paragraph, when timely implementation of the requirements set forth in this Consent Decree becomes impossible, despite the timely good-faith efforts of Defendants, due to circumstances beyond the reasonable control of Defendants or their agents, and which could not have been reasonably foreseen and prevented by the exercise of due diligence by Defendants. In no circumstances shall a claim of inability to pay be considered Force Majeure.

a. If Defendants claim impossibility, it shall notify Wishtoyo in writing within twenty-one (21) days of the date that Defendants first knew of the event or circumstance that caused or would cause a violation of this Consent Decree. The notice shall describe the reason for the nonperformance and specifically refer to this Section. It shall describe the anticipated length of time the delay may persist, the cause or causes of the delay, the measures taken or to be taken by Defendants to prevent or minimize the delay, the schedule by which the measures will be implemented, and the anticipated date of compliance. Defendants shall adopt all

reasonable measures to avoid and minimize such delays.

b. The Parties shall meet and confer in good-faith concerning the non-performance and, where the Parties concur that performance was or is impossible, despite the timely good faith efforts of Defendants, due to circumstances beyond the control of Defendants that could not have been reasonably foreseen and prevented by the exercise of due diligence by Defendants, new deadlines shall be established.

c. If Wishtoyo disagrees with Defendants' notice, or in the event that the Parties cannot timely agree on the terms of new performance deadlines or requirements, either party shall have the right to invoke the Dispute Resolution Procedure pursuant to Section IV. In such proceeding, Defendants shall bear the burden of proving that any delay in performance of any requirement of this Consent Decree was caused or will be caused by force majeure and the extent of any delay attributable to such circumstances.

VI. MISCELLANEOUS PROVISIONS

33. Construction. The language in all parts of this Consent Decree shall be construed according to its plain and ordinary meaning, except as to those terms defined in the 2015 Permit, the Clean Water Act, or specifically herein.

34. Choice of Law. The laws of the United States shall govern this Consent Decree.

35. Severability. In the event that any provision, paragraph, section, or sentence of this Consent Decree is held by a court to be unenforceable, the validity of the enforceable provisions shall not be adversely affected.

36. Correspondence. All notices required herein or any other correspondence pertaining to this Consent Decree shall be sent by regular mail or electronic mail as follows:

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If to Plaintiffs:

Jason Weiner
General Counsel
Wishtoyo Foundation / Ventura Coastkeeper
9452 Telephone Rd. #432
Ventura, CA 93004
jweiner.venturacoastkeeper@wishtoyo.org

with copies to:

Mati Waiya
Executive Director
Wishtoyo Foundation / Ventura Coastkeeper
9452 Telephone Rd. #432
Ventura, CA 93004
matiwaiya@wishtoyo.org

Geneva Thompson
Staff Attorney
Wishtoyo Foundation / Ventura Coastkeeper
9452 Telephone Rd. #432
Ventura, CA 93004
gthompson@wishtoyo.org

If to Defendant:

Luc Ong
EHS Manager
Arcturus Manufacturing Corporation
6001 Arcturus Avenue
Oxnard, CA 93033
Luc.Ong@cfworks.com

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With copies to:

Michael N. Mills
Partner
Stoel Rives LLP
500 Capitol Mall, Suite 1600
Sacramento, CA 95814
michael.mills@stoel.com

Notifications of communications shall be deemed submitted three (3) days after the date that they are postmarked and sent by first-class mail, or immediately after acknowledgement of receipt via email by the receiving party. Any change of address or addresses shall be communicated in the manner described above for giving notices.

37. Effect of Consent Decree. Plaintiffs do not, by its consent to this Consent Decree, warrant or aver in any manner that Defendants' compliance with this Consent Decree will constitute or result in compliance with any federal or state law or regulation. Nothing in this Consent Decree shall be construed to affect or limit in any way the obligation of Defendants to comply with all federal, state, and local laws and regulations governing any activity required by this Consent Decree.

38. Counterparts. This Consent Decree may be executed in any number of counterparts, all of which together shall constitute one original document. Telecopy and/or facsimile copies of original signature shall be deemed to be originally executed counterparts of this Consent Decree.

39. Modification of the Consent Decree. This Consent Decree, and any provisions herein, may not be changed, waived, discharged, or terminated unless by a written instrument, signed by the Parties.

40. Full Settlement. This Consent Decree constitutes a full and final settlement of this matter.

41. Integration Clause. This is an integrated Consent Decree. This Consent Decree is intended to be a full and complete statement of the terms of the

agreement between the Parties and expressly supersedes any and all prior oral or written agreements covenants, representations, and warranties (express or implied) concerning the subject matter of this Consent Decree.

42. Authority. The undersigned representatives for Plaintiffs and Defendants each certify that he/she is fully authorized by the party whom he/she represents to enter into the terms and conditions of this Consent Decree.

43. The provisions of this Consent Decree apply to and bind the Parties, including their respective successors in interest by way of merger, acquisition, or otherwise, and their permitted assigns. The Parties certify that their undersigned representatives are fully authorized to enter into this Consent Decree, to execute it on behalf of the Parties, and to legally bind the Parties to its terms.

44. There are no intended third-party beneficiaries to this Consent Decree, and only the Parties and their heirs, assigns, representatives, and successors may enforce this Consent Decree.

45. The Parties agree to be bound by this Consent Decree and not to contest its validity in any subsequent proceeding to implement or enforce its terms. By entering into this Consent Decree, Defendants do not admit liability for any purpose as to any allegation or matter arising out of this Action.

The undersigned representatives for Wishtoyo and Defendants each certify that he/she is fully authorized by the party whom he/she represents to enter into the terms and conditions of this Consent Decree and that this Consent Decree binds that party.

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IN WITNESS WHEREOF, the undersigned have executed this Consent Decree as of the date first set forth above.

IT IS SO ORDERED:

Date:_____

_____
Honorable Consuelo B. Marshall
United States District Judge

APPROVED AS TO CONTENT:

WISHTOYO FOUNDATION AND VENTURA COASTKEEPER

Dated: Nov. 25, , 2017

_____
Mati Waiya, Executive Director
Wishtoyo Foundation and its Ventura Coastkeeper Program

///

ARCTURUS MANUFACTURING COMPANY

Dated: November 27, 2017

Ruth Beyer, Senior Vice President
and General Counsel
Arcturus Manufacturing Company

PRECISION CASTPARTS CORP

Dated: November 27, 2017

Ruth Beyer, Senior Vice President
and General Counsel
Precision Castparts Corp

CARLTON FORGE WORKS

Dated: November 30, 2017

Luis Liu, General Manager
Carlton Forge Works

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APPROVED AS TO FORM:

STOEL RIVES LLP

Dated: November 30, 2017

Attorneys for Defendants Arcturus Manufacturing, Precision Cast Parts Corp and Carlton Forge Works

WISHTOYO FOUNDATION AND VENTURA COASTKEEPER

Dated: _____, 2017

Jason Weiner
General Counsel
Attorney for Plaintiffs Wishtoyo Foundation and its Ventura Coastkeeper Program

APPROVED AS TO FORM:

STOEL RIVES LLP

Dated: _____, 2017

Attorneys for Defendants Arcturus Manufacturing, Precision Cast Parts Corporation and Carlton Forge Works

WISHTOYO FOUNDATION AND VENTURA COASTKEEPER

Dated: November 27, 2017

Jason Weiner
General Counsel
Attorney for Plaintiffs Wishtoyo Foundation and its Ventura Coastkeeper Program

Exhibit 1

FACILITY CLOSURE PLAN

ARCTURUS MANUFACTURING CORPORATION
6001 ARCTURUS AVENUE
OXNARD, CALIFORNIA 93033
CERS ID Number: 10201954
Facility ID Number: 56-013-000308
EPA ID Number CAD982030660

October 4, 2017

Prepared For:
City of Oxnard Fire Department
CUPA Program
360 West Second Street
Oxnard, California 93030

Prepared By:

mc² Environmental • Chemical Engineering • Equipment • Construction

MC² Environmental Engineering Services
15 Hubble, Suite 110
Irvine, California 92618

Matthew L. McCullough, P.E.
Principal Engineer

Ramón Chávez, CHG
Principal Hydrogeologist

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1.0 EXECUTIVE SUMMARY

Arcturus Manufacturing Corporation (Arcturus) is a manufacturer of closed die forgings located at 6001 Arcturus Avenue, Oxnard, California 93030 (Site). This proposed Facility Closure Plan (Closure Plan) will govern removal and decontamination of equipment, hazardous materials, and hazardous wastes from the Site in accordance with the California Code of Regulations and Local Requirements under regulatory supervision of The City of Oxnard Fire Department/California Unified Program Agency (CUPA). Arcturus will close the facility in a manner that minimizes further maintenance and is protective of public health and environment (Title 22 CCR 66265.111) and will properly dispose of all contamination generated during closure (Title 22 CCR 66265.114). Commensurate with formal notification of closure, Arcturus will submit a Health and Safety Plan (HASP) that will be used to govern site activities.

This generalized closure plan includes:

- A Site description.
- Applicable regulatory requirements and notifications.
- An estimate of the maximum inventory of chemicals and wastes present as well as Safety Data Sheets.
- A description of how the facility will be closed.
- A description of environmental sampling.
- Procedures for certification of closure activities by an Independent Professional Engineer (IPE).

2.0 INTRODUCTION

This Facility Closure Plan (Plan) has been prepared by MC^2 Environmental Engineering Services, Inc. (MC^2) at the request of Arcturus Manufacturing Corporation for submittal to The City of Oxnard Fire Department CUPA to govern closure activities at Arcturus Manufacturing Corporation, 6001 Arcturus Avenue, Oxnard, California 93030 (Site; Figure 1. See Appendix A: CUPA Correspondence).

2.1 SITE DESCRIPTION

Arcturus Manufacturing Corporation (Arcturus; Site) was founded in 1937 in Santa Monica and has been located in Oxnard, California since 1962. Arcturus specializes in closed die forgings for aerospace industries. The facility is located at 6001 Arcturus Avenue, Oxnard, California 93030 (See Figure 1). The manufacturing processes at Arcturus include closed die forgings with a steam driven hammer being the main forging equipment. Operations include support activities such as forge furnaces. Other support operations include minor amounts of machining and grinding.

The Site encompasses approximately 8 acres of land (See Figure 2). The Site is bordered to the south by E. McWane Boulevard. To the east by Arcturus Avenue, to the west by a railroad tracks (part of a spur; not through tracks) and vacant land, to the north by 5901 Arcturus Avenue which has mixed commercial and industrial uses. The surrounding area consists of predominantly of open space to the south, east, and west with the land to the south being farm land.

The Site is developed with metal-wall buildings:

- Forge Shop: Houses all major forge equipment including forge furnaces and material handling equipment.
- Offices: No industrial activities. Located at the east end of the property.
- Lunch Building: No industrial activities. Houses lunch room and restrooms.
- Flash Cut Building: Houses plasma cut and has a connected bag house.
- Boiler House: Houses the steam boiler and support equipment.
- Maintenance Buildings: House maintenance and repair activities.
- Processing Building: Houses grinding and welding activities.
- Equipment Storage Building: Storage of equipment and materials such as lubricants.

Other structures/areas on the Site include:

- Cooling reservoir: Cools water from boiler operations to temperatures acceptable for industrial sewer discharge.
- Hazardous Waste Storage Area: Stores hazardous waste primarily non-RCRA wastes consisting of oily water and used adsorbent.
- Paved Storage Areas: Primarily storage of metal dies.
- Unpaved Storage Areas: Historically stored construction materials associated with furnace maintenance.

2.1.1 *CURRENT OPERATOR AND OWNER*

The site is currently operated by Arcturus Manufacturing Corporation at the same address.

Arcturus Manufacturing Corporation is owned by:

Precision Cast Parts
4650 SW Macadam Avenue #300
Portland, Oregon 97239
P: 503-777-3881

2.2 BACKGROUND ON SITE OPERATIONS

Arcturus is a manufacturer of closed die forgings. As a result, Arcturus operates a variety of forging, heat-treating and testing/finishing equipment. Arcturus processes aluminum, stainless steel, titanium, and nickel-based alloys. Forging consists of heating metal to sufficiently high temperatures in furnaces to make them malleable, and then forging using a closed die process. The parts are then water and/or air-cooled. There are some additional support operations like cutting, grinding, and machining.

2.2.1 *FORMER UNDERGROUND STORAGE TANKS*

Arcturus previously used diesel fuel as a standby fuel for the boiler.

- Arcturus stored diesel fuel in five 12,000 gallon underground storage tanks (USTs) which were removed under the regulatory supervision of the Ventura County Environmental Health Division in 1989.
- Subsequently, Arcturus continued to store diesel fuel in two 12,000 gallon tanks and one 10,000 tank. These tanks were removed under the regulatory supervision of the City of Oxnard CUPA in July 1998.
- The CUPA issued a Removal Action Completion Certificate, August 23, 2000 and no further action was required.
- The Regional Water Quality Control Board concurred with the completion certificate and closure on July 24, 2000.

The environmental documents for the former USTs will be reviewed and assessed as to whether site conditions at the time of case closure meet current regulatory standards. Based on this review, additional sampling may be recommended. A cursory review during preparation of the Plan indicated that residual levels of hydrocarbons in soil were consistent with current regulatory standards.

2.3 HAZARDOUS MATERIALS INFORMATION

Hazardous materials used at the Site includes various petroleum materials for hydraulics, water-based die lubricant with graphite, pressurized gas in cylinders for cutting, liquefied petroleum gas (LPG and Propane), water treatment chemicals associated with the boiler, and sulfuric acid for discharge pH balance (see Table 1, Hazardous Materials Inventory and Appendix B. Safety Data Sheets).

2.4 WASTE MANAGEMENT INFORMATION

Hazardous waste generated at the Site includes various oil containing wastes such as oily water and used adsorbent. Metal dusts from the facility are recycled. Hazardous wastes are disposed of at off-site hazardous waste facilities. Annual disposal of wastes by Arcturus ranges from 250 to 350 tons per year.

Blowdown from the boiler is first cooled in the cooling reservoir, pH adjusted, and subsequently discharged to the industrial sewer.

Storm water that contacts industrial activities at the Site flows via surface sheet flow to eight discharge points around the perimeter of the property (see Figure 2, Site Layout and Topography).

2.5 REGULATORY STATUS AND NOTIFICATION FOR CLOSURE

Arcturus will continue to operate the facility under existing permits until notice is provided to the Oxnard Fire Department of facility closure. The following activities will continue to be performed during normal facility operations:

- Hazardous materials and wastes will continue to be managed in accordance with CUPA requirements.
- On-site materials such as closed dies may be moved to other facilities, sold or scrapped.
- Equipment may be transferred, sold or scrapped and removed from the Site.

For the purposes of this Closure Plan, the estimated date of facility closure is September 30, 2017.

Arcturus will notify The City of Oxnard Fire Department/CUPA in writing of any intent to close the facility at least 30 days before Arcturus begins the implementation of closure activities. Arcturus will submit a Health and Safety Plan (HASP) and a Schedule of closure activities after approval of the closure plan.

The following general requirements apply to the Arcturus facility closure:

- California Fire Code 2016, 5001.6.3 Facility Closure Plan. Where a Facility Closure Plan is required in accordance with Section 5001.5 to terminate storage, dispensing, handling or use of hazardous materials, it shall be submitted to the fire code official not less than 30 days prior to facility closure. The plan shall demonstrate that hazardous materials that are stored, dispensed, handled or used in the facility will be transported, disposed of, or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety.
- Title 22 CCR 66262.34(a)(1). Specified requirements apply to 90 day generators with certain tanks, containers, drip pads, and containment buildings.
- Title 22 CCR 66265.111. Requires generator to close facility in a manner that minimizes further maintenance and is protective of public health and environment.
- Title 22 CCR 66265.114. Requires generator to properly dispose of all contamination generated during closure.

2.6 SECURITY AND FIRE SYSTEMS DURING CLOSURE

During the performance of closure activities, Arcturus will maintain at the Site the required hazardous materials and hazardous waste management security measures. These measures will include on-site security personnel as required, fencing, and warning signs. Security measures will be maintained until closure activities are completed.

Arcturus will maintain all fire alarms and suppression systems during closure activities until threat of fire is removed. Arcturus will contract with a licensed Fire Protection contractor to decommission the fire suppression system when appropriate.

2.7 SUMMARY OF AREAS OF CONCERN (AOCs) FOR ENVIRONMENTAL SAMPLING

Environmental samples are anticipated to be collected in the following areas to assess potential residual effects from industrial activities at the Site:

- Former Underground Storage Tank Area (Review of existing sampling and reports)
- Forge Shop
- Sumps
- Heat-Treating Furnaces
- Grind Shop and Equipment Storage Building
- Hot Water Cooling Pond
- Stormwater Sumps
- Industrial Wastewater Discharge Sumps and Clarifiers
- Quench Water Trench
- Steam Clean Trench
- Paved Area West of Forge Shop
- Oil Storage Area
- Hazardous Waste Accumulation Area
- Hazardous Materials Storage Area
- Satellite Hazardous Waste Accumulation Areas
- Waste Bins
- Unpaved Materials Storage Areas
- Wastewater Treatment Area
- Flash Cut/Bag House
- Lead-Based Paint (LBP) and Asbestos-Containing Materials (ACM)
- Groundwater Sampling
- Soil Gas Survey

3.0 CLOSURE ACTIVITIES

The following detailed closure activities in specific areas will be performed and general guidance will be provided. Specific closure activities may be modified by the Site IPE.

3.1 ABOVE-GROUND EQUIPMENT: HAMMERS AND PRESSES

Aboveground equipment, such as hammers and presses, will be generally transferred or sold as used equipment. However, in some cases, the equipment may be scrapped. In general, the following equipment removal and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for the removal of each piece of equipment will be noted in an inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Piping, conduit, and/or appurtenant equipment will be disconnected and decontaminated.
- Hydraulic oils will be removed if the equipment is scrapped or if considered necessary to transport it.
- Oils and lubricants may be sealed into the unit if the equipment is being reused and/or if considered necessary for preservation of equipment operation.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent materials.
    - Rinsates may be reused/recycled until judged ineffective and/or it is considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated that these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223)
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

- Once the equipment is removed, the surrounding concrete will be pressure washed and/or decontaminated to the extent practicable.
- If the equipment had a sump, the sump will be inspected by the IPE for cracks and degradation.

3.2 ABOVE-GROUND EQUIPMENT: FURNACES

Aboveground equipment, such as furnaces, will be generally be sold as used equipment or scrapped. However, refractory materials will be removed as part of closure activities. In general, the following equipment removal and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for the removal of each piece of equipment will be noted in an inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Piping, conduit, and appurtenant equipment will be disconnected and decontaminated.
- Refractory materials will be removed and consolidated into approved Department of Transportation (DOT) bins prior to transport.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or it is considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).
- Refractory materials will be characterized to determine their waste characteristics including tests for RCRA Metals and Toxicity Characteristics Leaching Procedure (TCLP). Refractory materials will be disposed of in

accordance with applicable California and Federal laws once the waste is profiled using a California Certified Analytical Testing Laboratory.

- Once the equipment is removed, the surrounding surfaces will be decontaminated following the proposed procedures described above.
- If the equipment had a sump, the sump will be inspected for cracks and degradation.

3.3 ABOVE-GROUND EQUIPMENT: MACHINING TOOLS

Aboveground equipment, such as machining tools, will be generally sold as used equipment. However, in some cases, the equipment may be scrapped. In general, the following removal equipment and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for the removal of each piece of equipment will be noted in an inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Piping, conduit, and appurtenant equipment will be disconnected and decontaminated.
- Prior to transport, hydraulic oils will be removed if the equipment is scrapped and/or if deemed necessary.
- Oils and lubricants may be sealed into the unit if the equipment is being reused and/or if considered necessary for preservation of equipment operation.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or it is considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).

- Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
- Used Adsorbent will be handled as Other Organic Solids (CWC 352).

- Once the equipment is removed, the surrounding concrete will be pressure washed and/or decontaminated to the extent practicable.
- If the equipment had a sump, the sump will be inspected for cracks and degradation.

3.4 ABOVE-GROUND EQUIPMENT: GRINDING AREAS AND BAGHOUSE

Aboveground equipment, such as grinding areas and the baghouse, will be generally sold as used equipment. However, in some cases, the equipment may be scrapped. In general, the following removal equipment and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for the removal of each piece of equipment will be noted in an inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Piping, conduit, and appurtenant equipment will be disconnected and decontaminated.
- Prior to transport, hydraulic oils will be removed if the equipment is scrapped and/or if deemed necessary.
- Oils and lubricants may be sealed into the unit if the equipment is being reused and/or if considered necessary for preservation of equipment operation.
- Decontamination procedures will generally consist of:
  - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
  - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
  - Contaminated solids will be consolidated into drums and/or bins as applicable.
  - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
  - Any free liquids on the ground will be consolidated using adsorbent material.
  - Rinsates may be reused/recycled until judged ineffective and/or it is considered too dirty.
  - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Testing Laboratory):
  - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).

- Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
- Used Adsorbent will be handled as Other Organic Solids (CWC 352).

- Once the equipment is removed, the surrounding concrete will be pressure washed and/or decontaminated to the extent practicable.
- Metal dusts will be characterized using a California Certified Analytical Testing Laboratory to determine their waste characteristics including tests for RCRA Metals and TCLP. Metal dusts will be recycled or disposed of in accordance with applicable California and Federal laws once they character of the material or waste is profiled.
- Unless otherwise specified or determined during closure activities, the decontaminated structure will be left in place at the time of closure.

3.5 MATERIAL HANDLING EQUIPMENT

Material handling equipment, such as manipulators and forklifts, will be generally sold as used mobile equipment. However, in some cases, the equipment may be scrapped. In general, the following equipment removal and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for each piece of equipment will be noted in the inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Hydraulic oils will be removed if the equipment is scrapped or if necessary to transport it.
- Oils and lubricants may be sealed into the unit if they are being reused and if considered necessary for preservation of equipment operation.
- Decontamination procedures will generally consist of:
  - Removal of surface materials and free-materials with performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
  - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
  - Contaminated solids will be consolidated into drums and/or bins as applicable.
  - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
  - Any free liquids on the ground will be consolidated using adsorbent material.
  - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
  - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated

these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):

- Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
- Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
- Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.6 ABOVE-GROUND STRUCTURES

Above-ground structures, such as buildings, will be generally left for any future owner of the Site. In some cases, buildings may be demolished; however, unless otherwise specified and/or determined during closure activities, the decontaminated structure will be left in place at the time of closure.

In general, the following decontamination procedures will be followed:

- Under the direction of the IPE, each building will be inspected and specific actions required for each piece of building will be noted in the inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Decontamination procedures will generally consist of:
  - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
  - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
  - Contaminated solids will be consolidated into drums and/or bins as applicable.
  - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
  - Any free liquids on the ground will be consolidated using adsorbent material.
  - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
  - Detergents may be used to enhance material removal.
- If the building is processed as scrap metal or sold for reuse following general decontamination, the building material will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
  - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
  - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
  - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.7 BOILER AND RELATED EQUIPMENT

The boiler and related equipment are anticipated to be sold as used equipment. If no buyer is found, the equipment may be scrapped. In general, the following equipment removal and decontamination procedures will be followed:

- Under the direction of the IPE, each unit will be inspected and specific actions required for each piece of equipment will be noted in the inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Water from the equipment will be drained into the cooling pond and subsequently discharged through the industrial wastewater sewage system in accordance with the permitted requirements.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquid water will be pumped into the cooling pond.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.8 HOT WATER COOLING POND

The hot water cooling pond is anticipated to be left in place. Once site operations have been discontinued and the boiler and related equipment are drained, the hot water cooling pond will be drained to the industrial wastewater sewer discharge. In general, the following decontamination procedure will be followed:

- Water from the unit will be drained into the cooling pond and drained through the industrial wastewater sewer in accordance with the permitted requirements. Under the direction of the IPE, once drained, the water cooling pond will be inspected and specific actions required will be noted in the inspection form.
- Metallic materials generated during closure activities will be recycled as scrap metal to the extent practicable.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed with shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquid water will be pumped to the cooling pond and then drained via the industrial wastewater sewer.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows(subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.9 HAZARDOUS WASTE STORAGE AREA

The hazardous waste storage area will continue to be used during the closure of the Site and until all wastes have been removed from the property. At the time of facilty closure, the hazardous waste containment area will be inspected and decontaminated in accordance with the following general procedures. Unless otherwise specified and/or determined during closure activities, the decontaminated containment structure will be left in place at the time of closure.

- At the time of closure, the containment area will be inspected by the IPE. Specific actions required for that area will be noted in the inspection form and carried out by the closure team.
- The containment area will be inspected by the IPE for the presence of cracks, fissures, missing seals, etc. Any visual cracks and/or gaps found in the containment area will be sealed prior to commencement of cleaning to prevent migration of rinsate outside of the containment area and/or to the underlying soils.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing sweepers, shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- The volume of any wash water will be kept to a minimum to minimize waste generation. Wash water will be reused as in a counter-rinse fashion (i.e. final rinse water will be reused as primary rinse water).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).
- The containment sump will be inspected for cracks and/or degradation.

3.10 HAZARDOUS MATERIALS STORAGE AREA

The hazardous materials storage area will continue to be used until all new materials have been removed from the Site. At the time of facility closure, the hazardous materials storage area will be inspected and decontaminated in accordance with the following general procedures. Unless otherwise specified and/or determined during closure activities, the decontaminated containment structure will be left in place at the time of closure.

- At the time of closure, the hazardous materials storage area will be inspected by the IPE. Specific actions required for the area will be noted in the inspection form and carried out by the closure team.

- The containment area will be inspected by the IPE for the presence of cracks, fissures, missing seals, etc. Any visual cracks and/or gaps found in the containment area will be sealed prior to commencement of cleaning to prevent migration of rinsate outside of the containment area and/or the underlying soils.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing sweepers, shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- The volume of any wash water will be kept to a minimum to minimize waste generation. Wash water will be reused as in a counter-rinse fashion (i.e. final rinse water will be reused as primary rinse water).
- If any equipment is processed as scrap metal and/or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.11 STORM WATER SUMPS AND PIPING

Associated storm water sumps and piping are anticipated to be left in place. In general, the following removal and decontamination procedures will be followed:

- Once site operations have been discontinued, the storm water sumps will be drained. Any free water in the sumps will be consolidated with the rinse water waste generated. Once drained, and upon the direction of the IPE, the storm water sumps will be inspected and potential specific actions that might be required will be noted in the inspection form.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquid water will be pumped to the cooling pond and then drained via the industrial wastewater sewer.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal and/or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.11 INDUSTRIAL WASTEWATER DISCHARGE PIPING AND CLARIFIERS

Associated industrial wastewater discharge piping, sumps, and clarifiers are anticipated to be left in place. In general, the following removal and decontamination procedures will be followed:

- Once Site operations have been discontinued, the industrial wastewater discharge piping will be allowed to drain to the extent feasible
- Once drained, and upon the direction of the IPE, the wastewater piping, sumps and clarifiers will be inspected and potential specific actions that might be required will be noted in the inspection form.
- Any free standing water in the sumps and/or clarifiers will be characterized for pH and will be pumped into the following clarifier stage for their eventual discharge.

- Upon the direction of the IPE, free standing water may be consolidated with the rinse water waste into totes and/or taken off-site for disposal utilizing a vacuum truck.
- Any sludge present will be removed in accordance with applicable decontamination procedures and managed as hazardous waste until the sludge is properly profiled.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing shovels, scrapers, pressure washers, and/or other equipment.
    - Free-liquid water will be pumped to the cooling pond and then drained via the industrial wastewater sewer.
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Equipment may be enclosed in plastic sheeting and/or other materials prior to their removal from the Site.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).
- The IPE will inspect the industrial waste water discharge sumps and clarifiers.

3.12 PAVED MATERIALS STORAGE AREAS

The paved storage areas will continue to be used during the closure of the Site until all materials have been removed from the property. At the time of facility closure, the area will be inspected and decontaminated in accordance with the following general procedures. Unless otherwise specified and/or determined during closure activities, the decontaminated pavement will be left in place at the time of closure

- Materials and equipment will be removed from the Site as appropriate as either commercial goods, recycled materials, waste, etc.
- If any equipment or materials are processed as scrap metal and/or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- At the time of closure, and once clear of materials and equipment, the area will be inspected by the IPE. Specific follow up actions required for the area will be noted in the inspection for and carried out by the closure team.

- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing sweepers, shovels, scrapers, pressure washers, and/or other equipment.
    - It is anticipated that the solid debris to be generated will be considered non-hazardous in nature. The IPE will be consulted on the consolidation, recycling, segregation and characterization of the debris
    - Contaminated solids will be consolidated into drums and/or bins as applicable.
    - Any free liquids on the ground will be consolidated using adsorbent material.
    - Rinsates may be reused/recycled until judged ineffective and/or are considered too dirty.
    - Detergents may be used to enhance material removal.
- In order to minimize generation of waste, the volume of any wash water will be kept to a minimum. Wash water will be reused as in a counter-rinse fashion (i.e. final rinse water will be reused as primary rinse water).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
    - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
    - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
    - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.13 UNPAVED MATERIALS STORAGE AREAS

The unpaved storage areas will continue to be used during the closure of the Site until all materials have been removed from the property. At the time of facility closure, the area will be inspected and decontaminated in accordance with the following general procedures:

- Materials and equipment will be removed from the Site as appropriate as either commercial goods, recycled materials, waste, etc.
- If any equipment or materials are processed as scrap metal and/or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- At the time of closure and once clear of materials and equipment, the area will be inspected by the IPE. Specific follow up actions required for the area will be noted in the inspection form and carried out by the closure team.
- Decontamination procedures will generally consist of:
    - Removal of surface materials and free-materials will be performed utilizing sweepers, shovels, scrapers, pressure washers, and/or other equipment.
    - The IPE will be consulted on the consolidation, recycling, segregation and characterization of the waste.

- Discolored debris and/or contaminated solids will be consolidated into drums and/or bins as applicable.

- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
  - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).
  - Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
  - Used Adsorbent will be handled as Other Organic Solids (CWC 352).

3.14 GENERAL ACTIVITIES IN AREAS NOT OTHERWISE DISCUSSED

The following generalized procedure will be followed for areas otherwise not discussed:

- The area will be inspected by the IPE and specific actions required will be noted in the inspection form.
- Metallic materials generated from Site closure activities will be recycled as scrap metal to the extent practicable.
- Piping, conduit, and appurtenant equipment will be disconnected and decontaminated.
- Hydraulic oils will be removed if the equipment is scrapped or if necessary to transport it.
- Oils and lubricants may be sealed into the unit if the equipment is being reused and/or if considered necessary for preservation of equipment operation.
- Decontamination procedures will generally consist of:
  - Removal of surface materials and free-materials will be performed utilizing sweepers, shovels, scrapers, pressure washers, and/or other equipment.
  - Free-liquids will be pumped into drums, totes, and/or tanks as applicable.
  - Contaminated solids will be consolidated into drums and/or bins as applicable.
  - Equipment may be enclosed in plastic sheeting and/or other materials prior to removal from the Site.
  - Any free liquids on the ground will be consolidated using adsorbent materials.
  - Rinsates may be reused/recycled until judged ineffective and/or it is considered too dirty.
  - Detergents may be used to enhance material removal.
- If the equipment is processed as scrap metal or sold for reuse following general decontamination, the equipment will not meet the definition of a solid or hazardous waste (22 CCR Section 66261.3 and 40 CFR Section 261).
- Waste materials from decontamination operations will be consolidated to the extent practicable. Sampling of the consolidated materials will be conducted to characterize the material for waste disposal purposes prior to disposal. It is anticipated that wastes from Site closure activities will be Non-RCRA Wastes. It is anticipated these wastes will be handled as follows (subject to characterization after generation by a California Certified Analytical Testing Laboratory):
  - Free petroleum will be handled as Waste Oil and Mixed Oil (CWC 221).

- Rinse water with petroleum will be handled as Unspecified Oil-Containing Waste (CWC 223).
- Used Adsorbent will be handled as Other Organic Solids (CWC 352).

- Once the equipment is removed, the surrounding concrete will be pressure washed and/or decontaminated to the extent practicable following the proposed procedures described above.

3.15 DECONTAMINATION OF CLEAN-UP EQUIPMENT

Equipment used for decontamination will be cleaned along with and within temporary secondary containment structures. Equipment will be scraped and brushed to remove solid residue which will be subsequently segregated. If rinsing is determined necessary, rinse water will be contained by the secondary containment structure of the hazardous waste storage area. In order to minimize waste generation, rinse water will be recycled where possible. Rinse water will be containerized and managed as a waste until characterized and disposed of in accordance with applicable regulations.

Arcturus does not anticipate that heavy equipment, such as cranes and demolition equipment, will come into contact with hazardous wastes. For example, a crane will be used to remove a hammer only after the equipment has been cleaned and decontaminated. Therefore, decontamination of heavy equipment should not be necessary during closure activities. If necessary, heavy equipment will be cleaned with a scraping, brushing, and/or rinsing using a pressure washer with a non-phosphate detergent/water solution and a tap water rinse. All wash/rinse water will be containerized and managed as a waste until characterized and disposed of in accordance with applicable regulations.

Wastes generated during the implementation of the Closure Plan will be managed as a waste until characterized. Wastes will be stored in labeled DOT-approved containers. The container will be labeled with the contents, date, company name, contact name and phone number. Subsequently, the wastes will be disposed off-site based on the corresponding analytical test results and in accordance with applicable regulations. Disposal procedure, including disposal facilities, transportation and manifesting will be available for inspection by CUPA and documented in the Closure Report.

4.0 ENVIRONMENTAL SAMPLING ACTIVITIES

The following environmental sampling activities in each specific areas will be conducted under the supervision of a Registered Certified Hydrogeologist or Registered Professional Geologist. Specific sampling activities may be modified by the Site IPE, CHG, PG based on observations at the Site. Because of the nature of facility closure activities, sampling may occur in a phased approach as different areas of the facility are closed or accessible.

4.1 FORMER UST LOCATION

Arcturus previously used diesel fuel as a standby fuel for the boiler.

- Arcturus stored diesel fuel in five 12,000 gallon underground storage tanks (USTs) which were removed under the regulatory supervision of the Ventura County Environmental Health Division in 1989.
- Subsequently, Arcturus continued to store diesel fuel in two 12,000 gallon tanks and one 10,000 tank. These tanks were removed under the regulatory supervision of the City of Oxnard CUPA in July 1998.
- The CUPA issued a Removal Action Completion Certificate, August 23, 2000 and no further action was required.
- The Regional Water Quality Control Board concurred with the completion certificate and closure on July 24, 2000.

The environmental documents for the former USTs will be reviewed and assessed as to whether site conditions at the time of case closure meet current regulatory standards. Based on this review, additional sampling may be recommended. A cursory review during preparation of the Plan indicated that residual levels of hydrocarbons in soil were consistent with current regulatory standards.

4.2 FORGE SHOP SAMPLING

In the Forge Shop Building, soil will be sampled as follows (see preliminary locations in Figure 3):

- Soil samples will be collected at a minimum of six (6) locations in the interior of the Forge Shop. After completion of cleaning, the flooring surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Note, some of these samples may be located at other features of interest such as sumps or material storage areas. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, Carbon Chain, VOCs, SVOCs, PCBs, Cr(IV), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.2.1 *FORGE SHOP WIPE SAMPLING*

Four wipe samples will be gathered in the Forge Shop. The following analytical methods will be used (see Section 6.1):

- Title 22 Metals.

4.3 SUMPS

For each sump, soil will be sampled as follows (see preliminary locations in Figure 3):

- Each sump will be inspected by the IPE for cracks and degradation. One sampling location will be located adjacent to each sump. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions (such as encountering the boundary between fill and native soil) but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
  - TPH, VOCs, SVOCs, PCBs, Cr(IV), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.4 FORGE FURNACE AREA

Once the forge furnaces have been removed, soil in the furnace area will be sampled as follows (see preliminary locations in Figure 3):

- Six sampling locations will be located adjacent to or underneath the former furnace locations. Samples will be gathered between 0.5 feet bgs and 3 feet bgs. Sample locations will be determined by the Field Geologist and IPE based on site-specific observations.
- For each sample, the following methods will be used (see Section 6.1):
  - TPH and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.5 PROCESSING BUILDING (GRIND SHOP) AND EQUIPMENT STORAGE BUILDING

In the Grind Shop and Equipment Storage Building, soil will be sampled as follows (see Figure 3):

- Soil samples will be collected at eight (8) locations in the interior of the Building. After completion of cleaning, the flooring surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Note, some of these samples may be located at other features of interest such as sumps or material storage areas. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.5.1 GRIND SHOP WIPE SAMPLING

Four wipe samples will be gathered in the Grind Shop. The following analytical methods will be used (see Section 6.1):

- Title 22 Metals.

4.6 HOT WATER COOLING POND

At the hot water cooling pond, soil will be sampled as follows (see preliminary locations in Figure 3):

- Four (4) locations in the interior of the Cooling Pond are anticipated for collection of soil samples. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be

designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.7 STORMWATER SUMPS AND DISCHARGE LOCATIONS

At the stormwater sumps and discharge locations, soil will be sampled as follows (see preliminary locations in Figure 3):

- One sample will be gathered adjacent to each of the eight (8) stormwater discharge points. Samples will be gathered between ground surface to a maximum depth of 1 foot as determined by the Field Geologist based on site-specific conditions (such as discoloration).
- One sampling location will be located adjacent to each stormwater sump (5 locations). Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions (such as encountering the boundary between fill and native soil) but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- Groundwater will be sampled at three (3) of these locations as shown on Figure 3.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.8 INDUSTRIAL WASTEWATER DISCHARGE CLARIFIERS

At the industrial wastewater discharge clarifiers and discharge location, soil will be sampled as follows (see preliminary locations in Figure 3):

- One sampling location will be located adjacent to each clarifier and the discharge sump (3 sample locations total). Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions (such as encountering the boundary between fill and native soil) but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- Groundwater will be sampled at one (1) of these locations as shown on Figure 3.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.9 QUENCH WATER TRENCH

At the quench water trench, soil will be sampled as follows (see preliminary locations in Figure 3):

Soil samples will be collected at two (2) locations adjacent to the Quench Water Trench. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered). Two (2) sampling locations are anticipated as part of the Quench Water Trench sampling.

- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.10 STEAM CLEAN TRENCH

At the steam clean trench, soil will be sampled as follows (see preliminary locations in Figure 3):

Two (2) locations adjacent to the Steam Clean Trench are anticipated for collection of soil samples. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).

- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.11 PAVED AREA WEST OF FORGE SHOP

At the paved area west of the Forge Shop, soil will be sampled as follows (see preliminary locations in Figure 3):

- Soil samples will be collected at two (2) locations in the area noted above. After completion of cleaning, the pavement surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by

the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).

- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.12 OIL STORAGE AREA

At the oil storage area, soil will be sampled as follows (see preliminary locations in Figure 3):

- Soil will be sampled at two (2) locations. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 5 feet bgs. Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) feet bgs.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.13 HAZARDOUS WASTE ACCUMULATION AREAS

At the hazardous waste accumulation areas, soil will be sampled as follows (see preliminary locations in Figure 3):

- Three (3) locations are anticipated for collection of soil samples. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.

- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.14 HAZARDOUS MATERIALS STORAGE AREA

At the hazardous materials storage areas, one soil boring will be advanced as follows (see preliminary locations in Figure 3):

- Six (6) locations are anticipated for collection of soil samples – one at each area. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.15 SATELLITE HAZARDOUS WASTE ACCUMULATION AREAS

At each satellite hazardous waste accumulation area, one soil will be advanced as follows (see preliminary locations in Figure 3):

- Three (3) locations are anticipated for collection of soil samples – one at each area. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five 5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, and Title 22Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be

designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.16 WASTE BINS

At the waste bin area, two soil borings will be advanced as follows (see preliminary locations in Figure 3):

- Soil borings will be advanced in two (2) sampling locations. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.17 UNPAVED MATERIALS STORAGE AREAS

At the unpaved materials storage area, soil will be sampled as follows (see preliminary locations in Figure 3):

- Fifteen (15) locations are anticipated for collection of soil samples. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- Groundwater will be sampled at three (3) of these locations as shown on Figure 3.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, and Title 22 Metals.
    - Groundwater samples will also be analyzed for Cr(VI).
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.18 WASTEWATER TREATMENT AREA

At the wastewater treatment area, soil will be sampled as follows (see preliminary locations in Figure 3):

- One (1) location is anticipated for collection of soil samples. After completion of cleaning, the surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered).
- Groundwater will be sampled at this location as well as shown on Figure 3.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.19 FLASH CUT/BAG HOUSE

At the Flash Cut/Bag House area, soil will be sampled as follows (see preliminary locations in Figure 3):

- Two (2) sampling locations in the area noted above are anticipated for collection of soil samples. After completion of cleaning, the pavement surface will be inspected for discoloration, staining, cracks or gaps, which may have provided a mechanism for materials to migrate to underlying soils. Samples will be gathered between ground surface to a maximum depth of 20 feet (or until groundwater is encountered). Sampling intervals will be determined by the Field Geologist based on site-specific conditions but are generally anticipated to be between 0-12 inches bgs and then at five (5) foot intervals (or until groundwater is encountered). Two (2) sampling locations are anticipated as part of the general Forge Shop sampling.
- Note that one of the sample locations overlaps with the satellite hazardous materials area.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.20 LEAD-BASED PAINT (LBP) AND ASBESTOS-CONTAINING MATERIALS (ACM)

For equipment scheduled for demotion and removal, an asbestos survey will be perfomed by a CA Certified Asbestos Site Surveillance Technician (CSST) under the supervision of a CA Certified Asbestos Consultant (CAC) to identify asbestos containing materials within the selected pieces of equipment in order to determine proper handling procedures as part of the plant decommissioning project. A separate report will be issued documenting the results of the survey which consists of the following components:

- A visual inspection of representative materials scheduled for removal of demolition will be conducted to identify suspect asbestos containing materials.
- Bulk samples will be collected from suspect asbestos containing materials for submittal to a qualified laboratory for analysis.
- All bulk samples will be analyzed by a state-certified laboratory by polarized light microscopy (PLM) methods to document the asbestos content in each material.
- All field observations, laboratory analytical data and other findings will be evaluated, with the separate written report summarizing findings and recommendations as necessary.

Arcturus does not intended to remove or demolish any painted structures and therefore does not intend to conduct any lead-based paint (LBP) survey.

Arcturus will disclose to all potential property buyers the following essential points:
1. The potential for LBP in structures built before 1978.
2. Lead from paint, paint chips, and dust can pose health hazards if not managed properly.
3. Any potential buyer should conduct LBP testing to more fully assess LBP

If during the facility closure, Arcturus intends to demolish or otherwise disturb a structure that may contain LBP, Arcturus will conduct a lead-based paint (LBP) survey of the structure.

4.21 GROUNDWATER SAMPLES

Groundwater samples will gathered at eight locations across the Site:

- Eight (8) locations will be sampled for groundwater using grab samples.
- Groundwater will be sampled at the locations shown on Figure 3.
- For each sample, the following methods will be used (see Section 6.1):
    - TPH, VOCs, SVOCs, PCBs, Cr(VI), and Title 22 Metals.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

4.22 SOIL GAS SURVEY

Soil gas samples will be gathered at eight locations across the Site:

- Soil vapor probes will be installed via direct-push method at eight (8) locations.
- Installation and sampling will follow combined agency guidance on soil gas/soil vapor sampling.
- For each sample, the following methods will be used (see Section 6.1):
    - VOCs.
- In general, if the analytical results were to indicate exceedances of applicable screening threshold limits as noted in Section 6.4, the environmental subsurface conditions at those soil sampling locations may be assessed via additional soil sample collection and analytical testing. The additional scope of work will be designed to evaluate the lateral, vertical, and surficial extent of potential environmental impacts that may be identified.

5.0 ENVIRONMENTAL SAMPLING METHODS

The following sampling methodologies will be used. Note that the Field Geologist and IPE may adjust techniques based on field conditions or in consultation with the CUPA. Because of the nature of facility closure activities, sampling may occur in a phased approach as different areas of the facility are closed or accessible. CUPA will be notified of any sampling 48 hours in advance.

5.1 PRE-SAMPLING ACTIVITIES

Prior to commencement of the field operations, each boring location was marked in accordance with Underground Service Alert (USA) requirements. The upper 5 feet of each of the soil borings advanced at the vacant lot area will be drilled by hand auger methods to minimize the potential for penetrating through any underground utilities should they be encountered at the boring locations. USA will be notified a minimum of 48 hours in advance of operations in order to clear the boring locations for possible conflicts with underground utilities.

5.2 SOIL SAMPLING METHODOLOGY

Soil, soil vapor, and groundwater monitoring points will be collected via Geoprobe equipment. After utility clearance and initial 5 feet of sample points, borings will be advanced by using a hydraulically actuated, track-mounted, mobile Geoprobe rig. The rig will use nominal one inch or larger outside diameter casing rods. The acetate lined casing rod will be hydraulically advanced into the subsurface to the desired sampling depth (approximately up to 20 feet bgs). All soil borings will be advanced to depth as noted in the sampling plan but typically to 20 feet bgs or groundwater, whichever is shallower.

Upon removal from the sampler, the selected soil sample portion will be trimmed flush with the end of the acetate sleeve, the ends were covered with Teflon™ film, and then sealed with plastic end caps. The approximately one-inch diameter acetate sleeve samples will be labeled with the appropriate boring identification (ID) number, sample depth, date, time, and sampler's initials, and placed in a sealable plastic bag. Samples will be stored in a cooler with ice for subsequent transportation to a certified analytical laboratory following standard chain-of-custody procedures.

A representative soil sample from each soil sampling interval will be extruded into a sealable plastic bag, closed tightly, broken up, and placed in a warm environment to facilitate volatilization of organic vapors trapped in the soil. After completing each boring, the probe of a multiple-gas air-monitoring instrument (MultiRAE Plus Photo Ionization Detector, PID, with multi-gas parameters including LEL/VOCs, O2, CO, H2S) was introduced into the plastic bag to measure the concentration of volatile organic vapors from the headspace within each plastic bag. The volatile organic vapors readings on soil samples when detected will be presented in the soil boring logs.

The borings will be logged from the ground surface to their total depth using a combination of visual observation of drill cuttings, close examination of soil samples, and drilling equipment behavior. Soils will be classified in accordance with the Unified Soils Classification System (USCS) and assigned a group name and symbol. In addition to the group name and symbol, additional descriptive information such as color, moisture condition, consistency of fine-grained/relative density of coarse-grained soils, plasticity of fines, grain size distribution, maximum particle size, and stratification were included in the log descriptions. The descriptions also included notations on visual and olfactory indications (staining and hydrocarbon odor) of soil contamination. Each boring will be logged by a State of California Registered Geologist.

All drilling equipment will be thoroughly decontaminated prior to use and between drilling locations to avoid cross contamination. The sampler will utilize nitrile gloves or equivalent. Gloves will be changed between each sample. The drilling equipment used will be washed with Alconox™ and potable water followed by two (2) rinses with potable water. Sufficient time will be allowed for the equipment to dry prior to reuse.

Boring locations will be located via measuring tape or by California-licensed surveyors.

5.3 GROUNDWATER SAMPLING METHODOLOGY

Once groundwater is encountered in selected borings, the sampling rod will be removed from the borehole and a one-inch diameter PVC pipe, will be lowered five-feet were screened (0.020 inch slots), installed into the borehole enabling groundwater to recharge into the screen for subsequent sampling. If dry, a borehole will be left open overnight prior to collecting grourdwater samples.

Prior to groundwater sampling, static water levels will be measured in all the boreholes.

Groundwater levels will be measured with a Solinst® electric probe to the nearest hundredth (0.01) of a foot. When water is encountered, groundwater samples will be obtained using a ½-inch stainless steel top-emptying bailer or a low-flow pump. The stainless steel bailer will be lowered into the PVC pipe to facilitate water sampling. If a pump is used, Teflon tubing will be lowered into the groundwater.

Groundwater samples will be decanted into laboratory provided containers appropriate for each sample type. VOCs will be collected in 40-ml glass vials allowing no headspace. Unpreserved one-liter capacity amber glass bottles were used to collect water samples for TEPH and PCBs testing.

Recovered groundwater samples will be labeled, placed in a cooler with ice, and transported to the analytical laboratory following standard chain-of-custody protocol.

At the conclusion of the groundwater sampling activities, all boreholes were backfilled with a neat cement grout from their total depth to the ground surface.

5.4 SOIL GAS SAMPLING METHODOLOGY

In order to install the soil gas probes, when the casing rod reaches the proposed total depth of 5 feet bgs, the drilling rods will be pulled out and nested soil gas survey probes will be installed using a -inch long poly diffuser attached with a 0.25-inch diameter Teflon™ tubing. The tubing with the diffuser will be lowered to depth and Monterey-type No. 2/12 silica sand will be slowly added to form a filter pack. The annular seal will be constructed using hydrated Enviroplug No.8 bentonite. Polyethylene locking valves will be used to cap the end of the tubing. The tubing will be properly marked at the surface to identify the probe location and depth.

All soil gas probes will be purged and samples collected by the operator of the on-site mobile analytical laboratory. Soil gas samples will be collected in glass gas-tight syringes equipped with Teflon™ plungers.

The syringe will be walked over to the on-site mobile analytical laboratory and the sample was injected into an on-board gas chromatograph/mass spectrometer (GC/MS) for analysis.

Instrument calibration verification, QC reference standards, instrument blanks and ambient air blanks will be analyzed every twelve (12) hours as prescribed by the method. In addition, matrix spike (MS) and matrix spike duplicates (MSD) were analyzed with each batch of soil gas samples. A duplicate sample was analyzed each day of the sampling activity.

Weather conditions will be monitored and soil gas probes will be sampled if there has been no substantial precipitation for a minimum of 2 days prior to the sampling event.

5.5 ASBESTOS CONTAINING MATERIALS (ACM) SAMPLING

For equipment scheduled for demotion and removal, an asbestos survey will be performed by a CA Certified Asbestos Site Surveillance Technician (CSST) under the supervision of a CA Certified Asbestos Consultant (CAC) to identify asbestos containing materials within the selected pieces of equipment in order to determine proper handling procedures as part of the plant decommissioning project. A separate report will be issued documenting the results of the survey which consists of the following components:

- A visual inspection of representative materials scheduled for removal of demolition will be conducted to identify suspect asbestos containing materials.
- Bulk samples will be collected from suspect asbestos containing materials for submittal to a qualified laboratory for analysis.
- All bulk samples will be analyzed by a state-certified laboratory by polarized light microscopy (PLM) methods to document the asbestos content in each material.
- All field observations, laboratory analytical data and other findings will be evaluated, with the separate written report summarizing findings and recommendations as necessary.

5.6 LEAD-BASED PAINT SURVEY

Arcturus does not intended to remove or demolish any painted structures and therefore does not intend to conduct any lead-based paint (LBP) survey.

Arcturus will disclose to all potential property buyers the following essential points:

4. The potential for LBP in structures built before 1978.
5. Lead from paint, paint chips, and dust can pose health hazards if not managed properly.
6. Any potential buyer should conduct LBP testing to more fully assess LBP

If during the facility closure, Arcturus intends to demolish or otherwise disturb a structure that may contain LBP, Arcturus will conduct a lead-based paint (LBP) survey of the structure.

5.7 MANAGEMENT OF INVESTIGATION DERIVED WASTE

Wastes generated during the implementation of the Closure Plan will be managed as a waste until characterized. Wastes will be stored in labeled DOT-approved containers. The container will be labeled with the contents, date, company name, contact name and phone number. Subsequently, the wastes will be disposed off-site based on the corresponding analytical test results and in accordance with applicable regulations. Disposal procedure, including disposal facilities, transportation and manifesting will be available for inspection by CUPA and documented in the Closure Report.

6.0 ANALYTICAL TESTING AND COMPARISON OF RESULTS

It is anticipated that environmental media samples will be collected at approximately 93 locations at the Site (see Figure 3, Anticipated Environmental Sample Locations). In addition, Quality Assurance (QA) samples will be collected and analyzed to assess the consistency and performance of the sampling and testing activities and it is anticipated that it will include duplicate samples.

Samples collected will be submitted for laboratory analysis to TestAmerica, Inc. (TestAmerica), a State of California certified analytical testing laboratory located in Irvine, California or to another certified analytical laboratory. All samples will be submitted to the analytical laboratory under chain-of-custody protocol and will include:

Duplicate samples.

- Equipment rinsate blanks.
- Field blanks.
- Trip blanks.
- Duplicate samples.

The duplicate samples will be collected using the same sampling procedures used to collect the media samples. All samples will be submitted "blind" to the laboratory.

6.1 ANALYTICAL METHODS

Depending on the target analysis for each media sample, the following analytical testing methods will be used:

- Total Petroleum Hydrocarbons using USEPA Method 8015B.
- Carbon Chain (CC) using USEPA Method 8015B.
- Diesel and Gasoline Range Organics (DRO/GRO/ORO) using USEPA Method 8015B.
- Title 22 Metals using USEPA Method 6010B/7471A (Soil) and 6010B/7470A (Water).
- Mercury (Hg) using USEPA Method 245.1.
- Chromium speciation (Cr^3 and Cr^6) using General Chemistry Methods and USEPA Method 7199 (Soil) and 218.6 (Water), respectively.
- Volatile Organic Compounds (VOCs) plus Oxygenates using USEPA Method 8260B (Soil and Water) and TO15 (Soil Gas).
- Semi-Volatile Organic Compounds (SVOCs) using USEPA Method 8270C.
- Polychlorinated Biphenyls (PCBs) using USEPA Method 8082.

The field blank, equipment rinsate, and trip blank samples will be analyzed for VOCs plus Oxygenates using USEPA Method 8260B.

Table 3 summarizes the proposed analytical testing methods by sample location.

6.2 SAMPLE CUSTODY

In order to maintain and document sample custody for all samples, chain-of-custody procedures will be strictly followed. A sample will be considered to be under custody only if:

- It is in actual possession of the responsible person,
- It is in view, following physical possession,
- It is in the possession of a responsible person and was locked or sealed to prevent tampering, and
- It is in a secure area.

Samples will be hand delivered by MC^2 personnel to State of California certified analytical laboratories the same day of their collection. At the time of sample transfer to the laboratory, chain-of-custody forms will be signed by both parties involved (person sampling and the laboratory representative), and will be dated. Chain-of-custody forms will be included with the corresponding analytical laboratory reports.

6.3 QUALITY ASSURANCE / QUALITY CONTROL

The following lists the proposed field sampling and laboratory quality QA/QC associated with the Sampling Program.

- All samples will arrive intact and on ice at the analytical laboratory.
- All samples will be analyzed within the prescribed holding times for the analyses performed.
- Surrogate recoveries will be within acceptable limits for all samples.
- Relative percent differences for the matrix spikes and matrix spike duplicates (MS/MSDs) will be within acceptable limits for all spike compounds.

6.4 COMPARISON OF SAMPLE RESULTS TO THRESHOLDS OF CONCERN

The objective of environmental sampling as detailed in this Facility Closure Plan is to identify "hot spots" where chemicals associated with Site activities may have been released to the environment. Therefore, all environmental sampling detailed as part of the Facility Closure Plan will be judgmental sampling where the selection of sampling location is based on observation, knowledge of the feature under investigation, and on professional judgment and experience. Judgmental sampling is distinguished from probability-based sampling in that inferences are based on professional judgment, not statistical scientific theory. When closing a facility with contaminants such as those present here, where migration in the environment is limited, judgmental sampling is the most efficient method (i.e. least number of samples) to accomplish the objective of identification of hot spots. This sampling plan is not designed to characterize environmental goals such as statistically relevant mean value for background concentrations on various chemicals.

USEPA Region 9 has developed Preliminary Remediation Goals (PRGs) and screening levels (SLs) which are risk-based screening levels generally modified based on site-specific data gathered during the sampling phase. Screening levels are used when a potential site is initially investigated to determine if potentially significant levels of contamination are present to warrant further investigation. These PRGs and SLs are commonly used by California regulatory agencies.

The Office of Environmental Health Hazard Assessment (OEHHA) of the California Environmental Protection Agency provides toxicological consultation to state and local government on possible human health and ecological risks associated with exposures to environmental contaminants at sites undergoing regulatory or voluntary cleanup.

OEHHA also develops certain health-based criteria for use at contaminated sites, specifically children-specific health guidance values for assessing risk at proposed or existing California school sites, and soil and soil-gas screening levels (also known as California Human Health Screening Levels or CHHSLs).

California Human Health Screening Levels (CHHSLs) are concentrations of chemicals in soil or soil gas below thresholds of concern for risk to human health—that is, an excess lifetime cancer risk of one-in-a-million (10^{-6}) and a hazard quotient of 1 for non-cancer health effects. CHHSLs were developed by OEHHA on behalf of the California Environmental Protection Agency, pursuant to Health and Safety Code Section 57008.

For evaluating whether site-specific data gathered may have an impact on aquatic toxicity, USEPA "Ecotox Thresholds" (ET) benchmark values will be used. ETs are defined as media-specific contaminant concentrations above which there is sufficient concern regarding adverse ecological effects to warrant further assessment.

7.0 CLOSURE SCHEDULE AND CERTIFICATION

This section discusses schedule and certification of the Facility Closure.

7.1 FACILITY CLOSURE SCHEDULE

Within 90 days of the last day of operation at Arcturus, Arcturus will remove all hazardous materials and wastes from the Site in accordance with the approved Closure Plan. Arcturus will complete closure activities within 180 days after receiving approval from the CUPA to implement the Closure Plan. Arcturus will request approval from the CUPA if:

- Removal of hazardous materials or wastes will take longer than 90 days.
- Implementation of the Closure Plan will take longer than 180 days.
- Arcturus needs to recommence operations at the Site.
- Arcturus needs an extension of time for any reason.

7.2 CLOSURE CERTIFICATION

When the Facility Closure is complete, Arcturus will submit to CUPA a Closure Certification, by both Arcturus and the IPE, stating that the facility has been closed in accordance with the CUPA approved Closure Plan. The Closure Certification will be presented in a Closure Certification Report, which will be prepared in accordance with the applicable portions of the California Code of Regulations and the California Fire Code. Additional information to be contained in the Closure Certification Report will include a Site history, Site plan, closure field notes, description of decontamination procedures, photographs of the field activities, environmental sample types, sampling locations and results, analytical laboratory reports, tabular summaries of analytical results, volume of waste and/or rinse water removed and copies of waste manifests. Any deviations from the approved CUPA Closure Plan will be also documented in the Closure Certification Report. The Closure Certification Report will be submitted within 60 days of completion of closure activities.

8.0 REFERENCES

California Environmental Reporting System (CERS), Arcturus Manufacturing Corporation (CERS ID:10201954) submittal to The City of Oxnard Fire Department (CUPA), Facility Information, 2017.

California Environmental Reporting System (CERS), Arcturus Manufacturing Corporation (CERS ID:10201954) submittal to The City of Oxnard Fire Department (CUPA), Hazardous Materials Inventory, 2017.

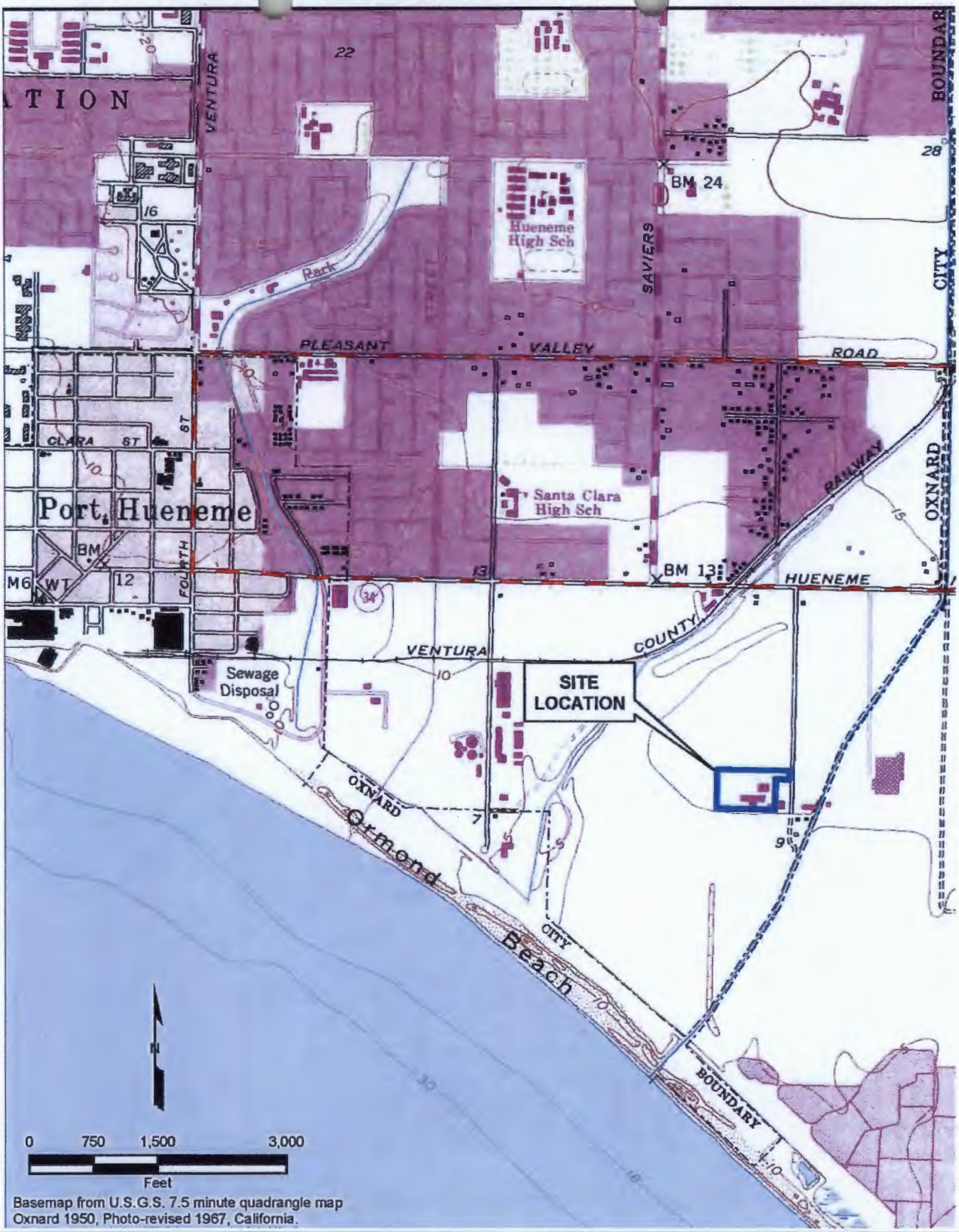

Figure 1: Site Location Map

MC² ENVIRONMENTAL ENGINEERING SERVICES
15 HUBBLE, SUITE 110
IRVINE, CA 92618
TEL: 949.748.5960
FAX: 949.748.5969

ARCTURUS MANUFACTURING CORPORATION
6001 ARCTURUS BOULEVARD
OXNARD, CA 93030

DATE: 6/25/2017

DRAWING IS NOT TO SCALE

N

LEGEND

- Storm Water Sump/Pump
- Discharge Point
- Storm Water Trench Drain
- Filtration Sock Location
- Storm Water Conveyance to DPS
- Storm Water Flow Direction
- Clarifier (Sanitary Sewer)
- A — Hazardous Materials Storage Area
- B — Satellite Hazardous Waste Accumulation Area
- Industrial Activity Area
- Propane
- Process Water Trench
- Unpaved Area
- Waste Water Treatment

Note

Aerial photo provided by Esri, 2015.

Feet
0 40 80

Projected Coordinate System
Datum: NAD 83
State Plane California Zone V
Units: Feet

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NO.	DESCRIPTION	DATE	BY
1	REFERENCE GSI ENVIRONMENTAL	01/24/2017	MM

Figure 2
FACILITY LAYOUT AND TOPOGRAPHY

MC² ENVIRONMENTAL ENGINEERING SERVICES 15 HUBBLE, SUITE 110 IRVINE, CA 92618 TEL: 949.748.5960 FAX: 949.748.5962	THIS DRAWING AND DESIGN ARE THE PROPERTY OF MC² ENGINEERING AND CONSTRUCTION, INC. AND IS NOT TO BE REPRODUCED IN WHOLE OR IN PART NOR EMPLOYED FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MC². THIS DRAWING LOANED SUBJECT TO RETURN.	ARCTURUS MANUFACTURING CORPORATION 6001 ARCTURUS BOULEVARD OXNARD, CALIFORNIA 93030

NO.	DESCRIPTION	DATE	BY
1	REFERENCE GSI ENVIRONMENTAL	01/24/2017	MM

Figure 3
ANTICIPATED ENVIRONMENTAL SAMPLE LOCATIONS

Table 1. Facility Closure Plan - Hazardous Materials Inventory
Arcturus Manufacturing Corporation
Oxnard, California 93030

Chemical Name	Common Name	Location	CAS Number	Physical State	Largest Container	Avg. Daily Amount	Max. Daily Amount	Annual Waste Amount	State Waste Code	Units
Sodium Hydroxide	Nalco ® 22310 - Boiler water Internal Treatment	Boiler Room	1310-73-2	Liquid	400	275	825			Gallons
Air - Compressed	Compressed air	Boiler Room	132259-10-0	Gas	250	250	750			Cubic Feet
Oxygen - Compressed	Compressed Oxygen	Maintenance, Flash Cut	7782-44-7	Gas	500	4000	6000			Cubic Feet
Oxygen - Liquid	Liquid Oxygen	Flash Cut	7782-44-7	Gas	45	90	128			Gallons
Arrowlube 600	Highly Refined Mineral Oil/Cylinder Oil	Machine Shop	64742-62-7	Liquid	55	55	660			Gallons
Arrow 69	Arrow 69 Water based lubricant	Machine Shop, Forge Plant		Liquid	55	330	1100			Gallons
Argon	Argon - Compressed	Maintenance, Flash Cut	7440-37-1	Gas	200	100	200			Cubic Feet
Argon & Carbon Dioxide	N.O.S. Cargon, Carbon Dioxide - CYLINDER	Maintenance, Flash Cut	7440-37-1	Gas	100	100	300			Cubic Feet
Acetylene	Acetylene - Compressed	Maintenance, Flash Cut	74-86-2	Gas	300	900	1500			Cubic Feet
Liquefied Petroleum Gas	Propane	N/E Corner of lot, Flash Cut, Mobile Equipment	74-98-6	Liquid	500	500	1200			Gallons
Arrowlube 604	ISO 68 hydraulic oil	North building (machine shop)	64742-62-7	Liquid	55	55	110			Gallons

Table 1. Facility Closure Plan - Hazardous Materials Inventory Arcturus Manufacturing Corporation Oxnard, California 93030 (CONTINUED)										
Arrowforge 322-B Steel Forging Compound	water based forge lube	North building (machine shop)		Liquid	55	770	1760			Gallons
Nickel-based alloy	Nickel-based alloy	Outdoor Storage Yard	7440-02-0	Solid	1000	6000	20000			Pounds
Steel Alloy	Steel Alloy	Outdoor Storage Yard		Solid	1000	6194	12000			Pounds
Titanium Alloy	Titanium Alloy	Outdoor Storage Yard	7440-32-6	Solid	1000	5000	30000			Pounds
Sulfuric acid (93%)	Sulfuric acid	Waste water treatment area	540-82-9	Liquid	200	150	200			Gallons
Non RCRA Hazardous Waste Solid	Used Adsorbent	Hazardous Waste Storage Area		Solid	55	10000	20000	120000	352	Pounds
Non RCRA Hazardous Waste Liquid	Oily Water & Waste Forge Lube	Hazardous Waste Storage Area		Liquid	1000	40000	80000	500000	223	Pounds
Lubricating Oils, Used	Waste Oil & Petroleum Products	Hazardous Waste Storage Area	70514-12-4	Liquid	55	55	165	660	221	Gallons
Excluded Recyclable Materials	Metal Dust/Bag House Dust	Bag House		Solid	55	40000	80000	500000		Pounds

Table 2. Major Equipment Inventory Arcturus Manufacturing Corporation Oxnard, California 93030				
Equipment Name	**Description**	**Location**	**Anticipated Disposition**	**Comments on Preparation for Removal**
Main Hammer	Steam-Driven Hammer, 30'x30'x30'	Forge Shop	Transfer, Sale or Scrap	Remove hydraulic oil, basic steam cleaning of exterior. [Wrap in plastic sheeting for transport?. Remove and demo concrete sumps]
Hammer 2	Hydraulically-Driven Hammer, 10'x10'x10'	Forge Shop	Transfer, Sale or Scrap	Remove hydraulic oil, basic steam cleaning of exterior. [Wrap in plastic sheeting for transport?. Remove and demo concrete sumps]
Hammer 3	Hydraulically-Driven Hammer, 10'x10'x10'	Forge Shop	Transfer, Sale or Scrap	Remove hydraulic oil, basic steam cleaning of exterior. [Wrap in plastic sheeting for transport?. Remove and demo concrete sumps]
Hammer 4	Hydraulically-Driven Hammer, 10'x10'x10'	Forge Shop	Transfer, Sale or Scrap	Remove hydraulic oil, basic steam cleaning of exterior. [Wrap in plastic sheeting for transport?. Remove and demo concrete sumps]
Machine Tooling	Electrically-Driven Lathe, 10'x5'x5', Mfg.	Forge Shop	Transfer, Sale or Scrap	Remove free oil or cutting fluid, basic steam or wipe cleaning of exterior.
Maintenance Equipment	Various: Welders, Drill Press, etc.	Various	Transfer, Sale or Scrap	Remove free oil or cutting fluid, basic steam or wipe cleaning of exterior.
Plasma Cutter	Plasma Cutter with Water Table, 5'x5'x5',	Flash Cut	Transfer, Sale or Scrap	Remove free oil or cutting fluid, basic steam or wipe cleaning of exterior.
Grind Booth	Hydraulically-Driven Hammer, 10'x10'x10'	Forge Shop	Transfer, Sale or Scrap	Remove and free metal or metal dust, basic steam cleaning of exterior.

Table 3. Range of Analytical Testing Methods[1] by Media Arcturus Manufacturing Corporation Oxnard, California 93030									
Sample Description	**Analytical Method**								**Comment**
	CC	TPH	DRO/GRO	VOCs	SVOCs	PCBs	TITLE 22 METALS	Cr(VI)	
Rinse Water	X	X	X	X			X		
Used Adsorbent		X	X	X			X		
Metal Dust							X		
Soil	X	X	X	X	X	X	X	X	See Section 5 for sample analytical by location.
Groundwater	X	X	X	X	X	X	X	X	See Section 5 for sample analytical by location.
Soil Vapor				X					

[1] See Section 6 for a description of analytical methods.

APPENDIX A: CUPA CORRESPONDENCE

Fire Department
360 West Second Street
Oxnard, California 93030
(805) 385-7722
Fax (805) 385-8009
www.ci.oxnard.ca.us

CITY OF OXNARD CALIFORNIA

August 31, 2017

VIA REGULAR MAIL
VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Luc Ong
Precision Castparts Corporation
7743 East Adam Street
Paramount, CA 90723-4200

RE: FACILITY CLOSURE PLAN; ARCTURUS MANUFACTURING CORPORATION, 6001 ARCTURUS AVENUE, OXNARD, CALIFORNIA

Mr. Ong:

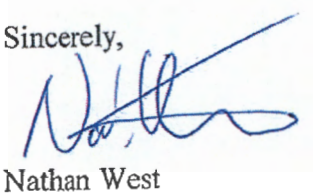
The Oxnard Fire Department, a Certified Unified Program Agency (CUPA) received the report prepared by your consultant, MC2 Environmental Engineering Services (MC2), titled *Facility Closure Plan* (*Plan*), dated July 12, 2017. The *Plan* outlines MC2's proposed methodology to close the facility in accordance with the California Fire Code and Title 22 of the California Code of Regulations.

Following third-party environmental review of the *Plan* and consultation with Cal/EPA's Department of Toxic Substances Control, the Oxnard Fire Department finds the environmental sampling proposed is not sufficient. Consequently, the *Plan* is disapproved.

No later than September 30, 2017, please revise and resubmit a plan which implements the recommendations provided by Rincon Consultants, Inc. in their third-party environmental review, enclosed.

Thank you for your assistance in this matter. Please contact me with any questions.

Sincerely,



Nathan West
CUPA Manager

Enclosure

cc: Jefferson Billingsley, Deputy City Attorney
Chief Darwin Base, Oxnard Fire Department
Ruth Osuna, Assistant City Manager

Rincon Consultants, Inc.
180 North Ashwood Avenue
Ventura, California 93003

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August 30, 2017
Project 17-04750

Jefferson Billingsley
Assistant City Attorney
City of Oxnard
360 West Second Street
Oxnard, California 93030

Subject: Facility Closure Plan Review Summary
6001 Arcturus Avenue, Oxnard, California

Dear Mr. Billingsley:

Pursuant to your request, we have prepared this review of the Facility Closure Plan (Plan) dated July 12, 2017 and forwarded to us by the City of Oxnard Fire Department. The Plan was prepared by MC^2 Environmental Engineering Services (MC^2) for the property located at 6001 Arcturus Avenue, Oxnard, California.

We understand that the City of Oxnard would like a review of the Plan to determine whether the actions proposed in the closure plan would adequately "minimize the need for further maintenance ... [and] control, minimize or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or run-off, or waste decomposition products to the ground or surface waters or to the atmosphere" (California Fire Code §§ 5001.5 and 5001.6.3, Title 22 CCR § 66265.111).

Pursuant to the Request for Proposal, our environmental review evaluated the adequacy of the Facility Closure Plan with respect to the following:

- Management of investigation-derived and closure-derived wastes.
- Contaminants of potential concern, environmental fate and transport.
- Sensitive environmental receptors.
- Laboratory analytical methods.
- Environmental sampling strategy and locations (i .e. "biased" sampling vs. SW-846 statistical sampling).
- Proposed screening methods and decision-making framework.

DOCUMENT REVIEW

Notice to Comply Letter

The City of Oxnard issued an April 26, 2017 Facility Closure Plan Requirement letter for Arcturus Manufacturing. The letter indicated that the California Fire Code, California Health & Safety Code, and California Code of Regulations require Large Quantity Generators of hazardous waste close facilities in a manner that minimizes further maintenance and is protective of public health and environment, and to properly dispose of all contaminated materials during closure.

Summary of Facility Closure Plan

A Facility Closure Plan dated July 12, 2017 was prepared by MC^2 at the request of Arcturus Manufacturing Corporation (Arcturus) for submittal to the City of Oxnard Fire Department, California Unified Program Agency (CUPA) to govern closure activities at Arcturus.

Arcturus was founded in 1937 in Santa Monica and has been located at the subject property since 1962. Arcturus specializes in closed die forgings for the aerospace industry. The manufacturing processes at Arcturus include closed die forgings with a steam-driven hammer being the main forging equipment. Operations include support activities such as heat treating. Other support operations include minor amounts of machining and grinding. The Site encompasses approximately eight acres of land. The Site is bordered to the south by E. McWane Boulevard, to the east by Arcturus Avenue, to the west by a railroad track and vacant land, and to the north by 5901 Arcturus Avenue which has mixed commercial and industrial uses. The surrounding area consists of predominantly of open space to the south, east, and west, with the land to the south being farm land.

The Site includes the following:

- Forge Shop: Houses all major forge equipment including heat treating furnaces and material handling equipment.
- Offices: No industrial activities. Located at the east end of the property.
- Lunch Building: No industrial activities. Houses lunch room and restrooms.
- Flash Cut Building: Houses plasma cut and has a connected baghouse.
- Boiler House: Houses the steam boiler and support equipment.
- Maintenance Buildings: House maintenance and repair activities.
- Processing Building: Houses grinding and welding activities.
- Equipment Storage Building: Storage of equipment and materials such as lubricants.
- Cooling reservoir (pond): Cools water from boiler operations to temperatures acceptable for industrial sewer discharge.
- Hazardous Waste Storage Area: Stores hazardous waste primarily non-RCRA wastes consisting of oily water and used adsorbent.
- Paved Storage Areas: Primarily storage of metal dies.
- Unpaved Storage Areas: Historically used to store construction materials associated with furnace maintenance.
- Former Underground Storage Tank (UST) area

Hazardous materials used at the site reportedly include various petroleum materials for hydraulics, water-based die lubricant with graphite, pressurized gas in cylinders for cutting, liquefied petroleum gas

(LPG and propane), water treatment chemicals associated with the boiler, and sulfuric acid for discharge pH balance.

Hazardous wastes generated at the subject property reportedly include various oil containing wastes such as oil water and used adsorbent. Metal dusts generated at the facility are recycled. Annual disposal of wastes ranges from 250 to 350 tons per year.

The Plan indicates that environmental samples are anticipated to be collected in the following areas to assess potential residual effects from industrial activities at the Site:

- Major Equipment: Hammers & Presses (if required).
- Hazardous Waste Storage (2 samples).
- Unpaved Storage Areas (4 Samples).
- Storm water Discharge Areas (if required).
- Surface Staining in Northeast Parking Area (2 samples).
- Cooling Pond (2 samples).

DTSC Email Correspondence

In an email dated August 18, 2017, DTSC indicated that the facility closure plan was inadequate. DTSC recommendations have been incorporated into our recommendations below. It should be noted that DTSC correspondence discussed a cooling reservoir, hot water cooling pond, and evaporation pit as three separate features. Upon review of the previously discussed documents, Rincon has concluded that these features all refer to the cooling reservoir/pond located in the northwest portion of the property. However, if any ponds or pits in addition to the cooling reservoir are observed during a future site inspection, they should be added to the sampling program.

RINCON OPINIONS

It is Rincon's opinion that the Facility Closure Plan is generally acceptable as it pertains to the decommissioning of equipment and building materials. However, the Plan does not adequately determine if the site has been impacted by the industrial operations and does not meet the facility closure plan requirements of the City Oxnard Fire Department. In our opinion, the Plan does not "minimize the need for further maintenance ... [and] control, minimize or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or run-off, or waste decomposition products to the ground or surface waters or to the atmosphere" (California Fire Code§ 5001.5 and 5001.6.3, Title 22 CCR § 66265.111).

Furthermore, it is Rincon's opinion that the Plan adequately addresses the following:

- Management of closure-derived wastes

The Plan does not adequately address the following:

- Contaminants of potential concern, environmental fate and transport
- Sensitive environmental receptors
- Laboratory analytical methods
- Environmental sampling strategy and locations
- Proposed screening methods and decision-making framework

RECOMMENDATIONS

We recommend additional soil sampling be completed at the site as follows. Prior to completion of soil sampling, a visual inspection of the site should be conducted to verify existing features and to determine boring locations.

Former USTS: Five 12,000-gallon diesel fuel underground storage tanks (USTs) were previously located at the subject property and were reportedly removed in 1989 under the regulatory oversight of the Ventura County Environmental Health Division. Diesel fuel for the boiler was subsequently stored in two 12,000-gallon USTs and one 10,000-gallon UST, which were removed in July 1998, under the regulatory supervision of the City of Oxnard Certified Unified Program Agency (CUPA). Details pertaining to site conditions at the time of closure were not provided in the Plan.

According to the State Water Resources Control Board (SWRCB) GeoTracker website, two leaking underground storage tank cases are associated with the subject property. The cases received regulatory closure in 1994 and 2000. UST closure documents were not available on the GeoTracker website. However, Rincon has identified documents pertaining to the UST closure activities on the Ventura County Environmental Health Leaking Underground Fuel Tanks (LUFT) and Voluntary Cleanup Program (VCP) – 1984 – May 2008 online database.

Rincon recommends that closure documents be obtained and reviewed to evaluate if site conditions at the time of case closure met current regulatory standards, and to determine if residual hydrocarbon-impacted soil remains in the subsurface. Based on the findings of the document review, additional soil sampling in the vicinity of the USTs may be warranted.

Forge Shop (Hammers and Presses): A minimum of 6 soil borings should be completed within the hammer and presses work area. The boring locations should be based on a visual inspection of the area. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet below ground surface (bgs) or where groundwater is encountered, whichever is shallower. Soil samples should be analyzed for total petroleum hydrocarbons (TPH), full carbon chain, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), chromium 6 (Cr+6), and polychlorinated biphenyls (PCBs), and Title 22 metals. In addition, a minimum of 4 wipe samples should be collected from interior surfaces within the Forge Shop and analyzed for Title 22 metals.

Sumps: Soil samples should be collected beneath any in-ground sumps at the site. Soil samples should be collected immediately beneath each sump and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, Cr+6, and metals.

Heat-Treating Furnaces: A minimum of 6 soil borings should be completed within the furnace area. The boring locations will be based on a visual inspection of the area. Soil samples should be collected at depths of 0.5 and 3 feet beneath furnaces and analyzed for TPH, PCBs and metals. In addition, a minimum of 4 wipe samples should be collected from interior surfaces and analyzed for Title 22 metals.

Process Building (Grind Shop) and Equipment Storage: A minimum of 8 soil borings should be completed within the Grind Shop and Equipment Storage areas. The boring locations should be based on a visual inspection of the area. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower.

Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, and metals. In addition, a minimum of 4 wipe samples should be collected from interior surfaces and analyzed for Title 22 metals.

Hot Water Cooling Reservoir/Pond/Evaporation Pit: The hot water cooling reservoir/pond has been used to collect hot wastewater prior to being drained to the industrial wastewater sewer. Rincon recommends that the cooling reservoir/pond be drained and four soil borings be advanced beneath the reservoir/pond. Soil borings should be located in areas where cracks or heavy staining is observed. Soil samples should be collected immediately beneath the pond (0 to 1 feet) and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, Cr+6, and Title 22 metals.

As previously stated, DTSC correspondence discussed a cooling reservoir, hot water cooling pond, and evaporation pit as three separate features. Upon review of the previously discussed documents, Rincon has concluded that these features are all the same cooling pond/reservoir located in the northwest portion of the property. However, if any ponds or pits in addition to the cooling pond/reservoir are observed during a future site inspection, they should be added to the sampling program.

Storm Water Sumps and Piping: It is Rincon's understanding that storm water sumps and piping will be left in place. Rincon recommends draining the sumps and inspecting for cracks. One soil boring should be advanced adjacent to each sump. Soil samples should be collected at depths of 0.5 feet and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. In addition, soil samples should be collected at a depth of 0.5 feet bgs adjacent to each of eight discharge points and the storm water trench drain illustrated on Figure 2 of the Plan. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, metals, and Cr+6.

Industrial Wastewater Discharge Sumps and Clarifiers: It is Rincon's understanding that industrial wastewater sumps, piping, and clarifiers will be left in place. Rincon recommends removing any liquid and/or sludge from the sumps and clarifiers and inspecting for cracks. One soil boring should be advanced adjacent to each sump and clarifier. Soil samples should be collected at depths of 0.5 feet and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, metals, Cr+6, and PCBs.

Quench Water Trench: Rincon recommends removing any liquid from the trench and inspecting for cracks. Soil samples should be collected adjacent to each trench at depths of 0.5 feet and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, and metals.

Steam Clean Trench: Rincon recommends removing any liquid from the trench and inspecting for cracks. Soil samples should be collected beneath each trench at depths of 0.5 feet and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, CR+6, and metals.

Paved Area West of Forge Shop (Unidentified Use): Following removal of all materials, the paved area should be inspected for any cracks or staining. A minimum of 2 soil borings should be advanced. Soil samples should be collected immediately beneath pavement and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, and metals.

Oil Storage Area: Two soil borings should be advanced. Soil samples should be collected at the surface and at 5 feet bgs. Samples should be analyzed for TPH and metals.

Hazardous Waste Accumulation Areas: One soil boring should be advanced at each of the hazardous waste accumulation areas. Soil samples should be collected at the surface and at 5-foot intervals to a total depth of 20 feet bgs. Samples should be analyzed for TPH, VOCs, SVOCs, PCBs, Cr+6, and metals.

Hazardous Materials Storage Areas: One soil boring should be advanced at each of the hazardous materials storage areas. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, Cr+6, and metals.

Satellite Hazardous Waste Accumulation Areas: One soil boring should be advanced at each of the satellite hazardous waste accumulation areas. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, and metals.

Waste Bins: Two soil borings should be advanced at the waste bins located near the center of the site. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, and metals.

Unpaved Materials Storage Areas: It appears there are several debris piles throughout this unpaved storage area. We recommend all debris and materials be removed and disposed per local and state regulations. It may be necessary to sample, analyze and profile the materials for disposal. Following removal of all materials, the unpaved materials storage area should be inspected for any staining. A minimum of 15 soil borings should be advanced within the unpaved materials storage areas on the western portion of the subject property, and four soil borings should be advanced in the former storage area in the northeast corner of the property. The soil boring locations should be based on a visual inspection of the area. They should also be located in close proximity to any stained soil or hazardous materials storage areas. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower, and analyzed for TPH, VOCs, SVOCs, metals, and PCBs.

Waste Water Treatment Area: One soil boring should be advanced at the wastewater treatment area. Soil samples should be collected at 0.5 feet bgs and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, Cr+6, and Title 22 Metals.

Flash Cut/Bag House: Two soil borings should be advanced within the Flash Cut/Bag House. Soil samples should be collected at the surface and at 5-foot intervals up to a total depth of 20 feet bgs or where groundwater is encountered, whichever is shallower. Samples should be analyzed for TPH, VOCs, SVOCs, metals, and PCBs.

Recommended analytical methods include the following:

TPH – EPA Method 8015M
VOCs – EPA Method 8260B
SVOCs – EPA Method 8270
PCBs – 8082A
Title 22 Metals – 6010B/7471A
Cr+6 – EPA Method 7196A

Lead-Based Paint (LBP) and Asbestos-Containing Materials (ACM): Based on the age of the facility, it is possible that LBP and ACM are present in onsite buildings. Therefore, LBP and ACM surveys should be conducted as part of the facility closure process.

According to the No Further Action letter for the BMW facility located adjacent to the subject property to the east, groundwater in the vicinity of the site is present at depths ranging from 5.5 to 6.5 feet bgs. Therefore, Rincon recommends collecting groundwater samples at a minimum of eight locations at the subject property. These locations should be spaced throughout the site and should also be based on field observations. Groundwater samples should be analyzed for TPH, VOCs, SVOCs, PCBs, metals, and CR+6.

In addition, Rincon recommends collecting a minimum of eight shallow soil vapor samples at the subject property. These locations should be spaced throughout the site and should also be based on field observations. Soil vapor samples should be collected at approximately 5 feet bgs.

Rincon recommends that all hazardous wastes and hazardous materials remaining onsite be removed and properly handled as described in the Facility Closure Plan.

The Plan indicates that the sample results may be compared to the following thresholds of concern:

- USEPA Region 9 Preliminary Remediation Goals (PRGs) and Screening Levels (SLs) which are now referred to as Regional Screening Levels (RSLs).
- OEHHA consultation - site specific screening levels
- California Human Health Screening Levels (CHHSLs)

To further evaluate "thresholds of concern" for toxicology, Rincon recommends a human health and ecological risk assessment should be conducted to determine health protective and environmentally protective screening levels. Additionally, due to the site's close proximity to the Ormond Beach Wetlands, a sensitive habitat, screening for aquatic toxicity should also be included in the sampling plan. For evaluating aquatic toxicity, USEPA "Ecotox Thresholds" should be used: https://www.epa.gov/sites/production/files/2015-11/documents/v3no2.pdf.

If impacted soil, groundwater, or soil vapor is identified, Rincon recommends engaging the Department of Toxic Substances Control (DTSC) for concurrence regarding additional environmental assessment and remediation, if warranted, and to determine site specific cleanup levels for contaminants identified at the site.

If the subject property is planned to be redeveloped, we recommend that a Soil Management Plan be developed that outlines procedures and responses in case contaminated materials are identified. An environmental professional should be present during future redevelopment activities (if any) to evaluate

the property for potential impacts not identified during closure activities. Furthermore, changes in land use may necessitate additional site assessment.

LIMITATIONS

This letter summarizes our review of a Facility Closure Plan prepared by MC^2. Rincon cannot attest to the validity of information provided by MC^2.

Our recommendations regarding the site are based on observations of reported site conditions by MC^2. The results of our evaluation are qualified by the fact that we have not conducted a visual inspection of the site.

Our recommendations are not intended to completely establish the quantities and distribution of contaminants present at the site. The concentrations of contaminants measured at any given location may not be representative of conditions at other locations. Further, conditions may change at any particular location as a function of time in response to natural conditions, chemical reactions and other events.

Our recommendations do not represent a warranty that all areas within the site are similar to those sampled.

Thank you for selecting Rincon Consultants for this project. Please contact us with any questions regarding this review.

Sincerely,

RINCON CONSULTANTS, INC.

R. Scott English, RME
Senior Program Manager

Walt Hamann, PG, CEG, CHG
Vice President

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CITY OF OXNARD CALIFORNIA

NOTICE TO COMPLY

April 26, 2017

Armando Bautista, Environmental Contact
Precision Castparts Corp
7743 E. Adam Street
Paramount, CA. 90723-4200

FACILITY CLOSURE PLAN REQUIREMENT FOR ARCTURUS MANUFACTURING CORPORATION, 6001 ARCTURUS AVENUE, OXNARD, CALIFORNIA

An inspection conducted at your facility by the Oxnard Fire Certified Unified Program Agency (CUPA) on January 10, 2017 revealed that your business intends to close the subject facility.

California Fire Code (CFC), California Health & Safety Code (HSC), and California Code of Regulations (CCR) requires Large Quantity Generators (LQG) of hazardous waste close facilities in a manner that minimizes further maintenance and is protective of public health and environment, and to properly dispose of all contamination generated during closure **[CFC, Section 5001.6.3; CCR, Section 66262.34(a)(1)(A)]**. **CCR, Sections 66265.111**, **66265.114**, and **67383.3** (Tank Cleaning) are incorporated by reference.

Provide CUPA a closure plan to include the following:

1. Business name and address.
2. Current operator and owner of business, including legal names, addresses and phone numbers.
3. Expected date of closure (if not known, please provide estimate), and if necessary, a schedule for closure activities which are listed below.
4. A detailed description of the type of facility, previous uses, quantities of all hazardous materials and hazardous waste generated onsite including number and capacities of all tanks and containers (if same as Hazardous Materials Inventory— Chemical Description forms on file with the State database CERS, please indicate so), and previous spill history.

5. Provide site map showing all storage areas for hazardous materials and hazardous wastes. Site map shall also depict facility location in relation to the immediately surrounding community and sensitive receptors, i.e., hospitals, day-care centers, schools, parks, environmental sensitive areas and storm drain access points (if same as Site Map on CERS, please indicate so).

6. Provide a complete list of all equipment to be removed from the facility, and proposed final disposition. For the purpose of this closure, equipment shall include: concrete, piping, ducts, tanks, sumps, clarifiers, treatment units and all other equipment associated with hazardous substances. Proposed methods of removing, transporting, disposing of or reusing all hazardous materials, including hazardous waste, and all containers. Provide copies of all manifests and/or receipts for closure actions already taken. If applicable, describe proposals for underground and/or aboveground storage tanks and tiered permitting treatment units.

7. Provide a detailed description of the steps needed to decontaminate all hazardous residues and contaminated components, equipment and soils, including but not limited to, procedures for cleaning equipment and removing contaminated soils, laboratory analysis methods for sampling and testing surrounding soils and criteria for determining the extent of decontamination necessary to properly close the facility along with the name of the laboratory being used.

8. Additional permits may be required from various regulatory agencies and must be identified in the closure plan.

9. A statement from the building owner confirming that all fire alarm and suppression systems will be mairtained in compliance with applicable requirements.

10. Provide the name and signature of the owner/operator or designated representative, title of signer, date of signature, and name of the document preparer.

11. ARRANGE FOR AN INSPECTION AFTER COMPLETION OF PLAN BY CONTACTING CUPA AT THE TELEPHONE NUMBER BELOW.

12. Please note that you must obtain CUPA approval prior to any deviation from the approved closure plan.

Provide a complete closure plan with plan check fee of $708.00, to cover costs associated with review of the plan and inspection at least 30 days prior to the commencement of any covered closure activities.

A post-closure report shall be submitted to CUPA within thirty (30) days after completion activities. The Specialist will review this report that must include all of the following:

1. Confirmation of adherence to all items included in the approved Facility Closure Work Plan. If any modifications occurred during the closure operations, a detailed explanation must be provided.

2. Laboratory analytical results for all sampling performed.

3. Documentation of proper disposition of all product and waste hazardous substances with photocopies of shipping papers, sales receipts, disposal certificates, hazardous waste manifest, etc.

4. Recommendation addressing whether further work is required or that closure is complete and no additional activities are necessary.

Upon satisfactory completion facility closure, the CUPA will issue written certification. Should you have any questions regarding this notice, please contact me at Boris.Medina@oxnard.org or via telephone at (805) 385-8316.

R.E.H.S.

Bo Medina, R.E.H.S.
Senior Fire Environmental Specialist
Oxnard Fire/CUPA

CERTIFIED MAIL No. 7002 2410 0004 0574 3889
Return Receipt Requested

APPENDIX B: SAFETY DATA SHEETS

SAFETY DATA SHEET

Acetylene

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Acetylene

Chemical name : acetylene

Other means of identification : Ethyne; Ethine; Narcylen; C2H2; Acetylen; UN 1001; Vinylene

Product use : Synthetic/Analytical chemistry.

Synonym : Ethyne; Ethine; Narcylen; C2H2; Acetylen; UN 1001; Vinylene

SDS # : 001001

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Fusible plugs in top, bottom, or valve melt at 98°C to 107°C (208°F to 224°F). Do not discharge at pressures above 15psig (103kpa). Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : acetylene

Other means of identification : Ethyne; Ethine; Narcylen; C2H2; Acetylen; UN 1001; Vinylene

CAS number/other identifiers

CAS number : 74-86-2

Product code : 001001

Ingredient name	%	CAS number
acetylene	100	74-86-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
acetylene	**NIOSH REL (United States, 10/2013).** CEIL: 2662 mg/m³ CEIL: 2500 ppm

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas.

Color : Colorless.

Molecular weight : 26.04 g/mole

Molecular formula : C2-H2

Melting/freezing point : -81°C (-113.8°F)

Critical temperature : 35.25°C (95.5°F)

Odor : Mild. Ethereal.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -18.15°C (-0.67°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 2.5%
Upper: 100%

Vapor pressure : 635 (psig)

Vapor density : 0.907 (Air = 1)

Specific Volume (ft^3/lb) : 14.7058

Gas Density (lb/ft^3) : 0.0691

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 1.2 g/l

Partition coefficient: n-octanol/water : 0.37

Auto-ignition temperature : 305°C (581°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
acetylene	0.37	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1001	UN1001	UN1001	UN1001	UN1001
UN proper shipping name	ACETYLENE, DISSOLVED	ACETYLENE, DISSOLVED	ACETYLENE, DISSOLVED	ACETYLENE, DISSOLVED	ACETYLENE, DISSOLVED
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 15 kg	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0 **Passenger Carrying Ship Index** 75 **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 38	-	-	**Passenger and Cargo Aircraft** Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 15 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
United States inventory (TSCA 8b): This material is listed or exempted.
Clean Air Act (CAA) 112 regulated flammable substances: acetylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
acetylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : This material is listed or exempted.
Malaysia : Not determined.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.
Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
Class F: Dangerously reactive material.

Section 15. Regulatory information

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Note: The instability hazard rating for acetylene, dissolved (stabilized acetylene) is 2.

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Comp. Gas, H280	Expert judgment According to package

History

Date of printing : 6/7/2016
Date of issue/Date of revision : 6/7/2016
Date of previous issue : 5/24/2016
Version : 0.03

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Air

Section 1. Identification

GHS product identifier : Air

Chemical name : air

Other means of identification : Compressed Air ; Breathing Quality Air ; synthetic air, reconstituted air, medical air, medical air USP.

Product use : Synthetic/Analytical chemistry.

Synonym : Compressed Air ; Breathing Quality Air ; synthetic air, reconstituted air, medical air, medical air USP.

SDS # : 001002

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May support combustion.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Use and store only outdoors or in a well ventilated place.

Response : Not applicable.

Storage : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Chemical name : air

Other means of identification : Compressed Air ; Breathing Quality Air ; synthetic air, reconstituted air, medical air, medical air USP.

CAS number/other identifiers

CAS number : Not applicable.

Product code : 001002

Ingredient name	%	CAS number
Nitrogen	76.5 - 80.5	7727-37-9
oxygen	19.5 - 23.5	7782-44-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : "None expected"

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : "None expected"

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Air

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Air

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Nitrogen	Oxygen Depletion [Asphyxiant]
oxygen	None.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Air

Section 9. Physical and chemical properties

Appearance

Physical state : Gas.

Color : Colorless.

Boiling/condensation point : -194.3°C (-317.7°F)

Melting/freezing point : -216.2°C (-357.2°F)

Critical temperature : Lowest known value: -146.95°C (-232.5°F) (nitrogen).

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Flash point : Not available.

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Highest known value: 1.1 (Air = 1) (oxygen). Weighted average: 1 (Air = 1)

Gas Density (lb/ft ^{3}) : 0.0749

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : "None expected"

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Air

Section 11. Toxicological information

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Nitrogen	0.67	-	low
oxygen	0.65	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1002	UN1002	UN1002	UN1002	UN1002
UN proper shipping name	Air, compressed	Air, compressed	Air, compressed	Air, compressed (nitrogen, oxygen)	Air, compressed (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: All components are listed or exempted.
United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

Section 15. Regulatory information

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Nitrogen	76.5 - 80.5	No.	Yes.	No.	No.	No.
oxygen	19.5 - 23.5	No.	Yes.	No.	No.	No.

State regulations

Massachusetts : The following components are listed: NITROGEN; OXYGEN (LIQUID)

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN; OXYGEN

Pennsylvania : The following components are listed: NITROGEN; OXYGEN

International regulations

International lists

National inventory

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: None of the components are listed.
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

Air

Section 16. Other information

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	On basis of test data

History

Date of printing : 5/24/2016

Date of issue/Date of revision : 5/24/2016

Date of previous issue : 5/24/2016

Version : 0.08

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Argon

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Argon

Chemical name : argon

Other means of identification : Argon.

Product use : Synthetic/Analytical chemistry.

Synonym : Argon.

SDS # : 001004

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Not applicable.

Response : Not applicable.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : argon

Other means of identification : Argon.

CAS number/other identifiers

CAS number : 7440-37-1

Product code : 001004

Ingredient name	%	CAS number
Argon	100	7440-37-1

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards. Acts as a simple asphyxiant.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : No specific data.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Argon	Oxygen Depletion [Asphyxiant]

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state	: Gas.
Color	: Colorless.
Molecular weight	: 39.95 g/mole
Molecular formula	: Ar
Boiling/condensation point	: -185.9°C (-302.6°F)
Melting/freezing point	: -189.2°C (-308.6°F)
Critical temperature	: -122.4°C (-188.3°F)
Odor	: Odorless.
Odor threshold	: Not available.
pH	: Not available.
Flash point	: [Product does not sustain combustion.]
Burning time	: Not applicable.
Burning rate	: Not applicable.
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Not available.
Vapor pressure	: Not available.
Vapor density	: 1.66 (Air = 1)
Specific Volume (ft^3/lb)	: 9.7087
Gas Density (lb/ft^3)	: 0.103
Relative density	: Not applicable.
Solubility	: Not available.
Solubility in water	: Not available.
Partition coefficient: n-octanol/water	: 0.74
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
SADT	: Not available.
Viscosity	: Not applicable.

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Incompatible materials	: No specific data.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 10. Stability and reactivity

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards. Acts as a simple asphyxiant.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Argon	0.74	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1006	UN1006	UN1006	UN1006	UN1006
UN proper shipping name	ARGON, COMPRESSED	ARGON, COMPRESSED	ARGON, COMPRESSED	ARGON, COMPRESSED	ARGON, COMPRESSED
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 

Section 14. Transport information

Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Limited quantity Yes. Packaging instruction **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). Explosive Limit and Limited Quantity Index 0.125 Passenger Carrying Road or Rail Index 75 Special provisions 42	-	-	Passenger and Cargo AircraftQuantity limitation: 75 kg Cargo Aircraft Only Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: This material is listed or exempted.
United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Section 15. Regulatory information

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Argon	100	No.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : Not determined.
Malaysia : Not determined.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.
Taiwan : Not determined.

Canada

WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	Expert judgment

History

Date of printing : 5/25/2016

Date of issue/Date of revision : 5/25/2016

Date of previous issue : 5/25/2016

Version : 0.03

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Airgas

Carbon Dioxide

Section 1. Identification

GHS product identifier : Carbon Dioxide

Chemical name : Carbon dioxide

Other means of identification : Carbonic, Carbon Dioxide, Carbonic Anhydride, R744, Carbon Dioxide USP

Product use : Synthetic/Analytical chemistry.

Synonym : Carbonic, Carbon Dioxide, Carbonic Anhydride, R744, Carbon Dioxide USP

SDS # : 001013

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Liquefied gas
Simple asphyxiant.

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
May increase respiration and heart rate.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.

Prevention : Use and store only outdoors or in a well ventilated place.

Response : Not applicable.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.
May cause frostbite.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Carbon dioxide

Other means of identification : Carbonic, Carbon Dioxide, Carbonic Anhydride, R744, Carbon Dioxide USP

CAS number/other identifiers

CAS number : 124-38-9

Product code : 001013

Ingredient name	%	CAS number
Carbon Dioxide	100	124-38-9

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Section 7. Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Carbon Dioxide	**ACGIH TLV (United States, 3/2015). Oxygen Depletion [Asphyxiant].** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **NIOSH REL (United States, 10/2013).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 10 hours. TWA: 5000 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 18000 mg/m³ 8 hours. TWA: 10000 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 44.01 g/mole

Molecular formula : C-O2

Melting/freezing point : Sublimation temperature: -79°C (-110.2 to °F)

Critical temperature : 30.85°C (87.5°F)

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : 830 (psig)

Vapor density : 1.53 (Air = 1) Liquid Density@BP: Solid density = 97.5 lb/ft3 (1562 kg/m3)

Specific Volume (ft^3/lb) : 8.7719

Gas Density (lb/ft^3) : 0.114

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.83

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

IDLH : 40000 ppm

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Carbon Dioxide	0.83	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1013	UN1013	UN1013	UN1013	UN1013
UN proper shipping name	CARBON DIOXIDE	CARBON DIOXIDE	CARBON DIOXIDE	CARBON DIOXIDE	CARBON DIOXIDE
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Limited quantity Yes. Packaging instruction **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). Explosive Limit and Limited Quantity Index 0.125 Passenger Carrying Road or Rail Index 75	-	-	Passenger and Cargo AircraftQuantity limitation: 75 kg Cargo Aircraft Only Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: This material is listed or exempted.
United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Carbon Dioxide	100	No.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

California Prop. 65

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Carbon dioxide	No.	No.	No.	No.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : This material is listed or exempted.
Malaysia : Not determined.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Liq. Gas, H280	Expert judgment

History

Date of printing : 2/11/2016

Date of issue/Date of revision : 2/11/2016

Date of previous issue : No previous validation

Version : 0.01

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
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SAFETY DATA SHEET

Airgas

Oxygen

Section 1. Identification

GHS product identifier : Oxygen

Chemical name : oxygen

Other means of identification : Molecular oxygen; Oxygen molecule; Pure oxygen; O2; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)

Product use : Synthetic/Analytical chemistry.

Synonym : Molecular oxygen; Oxygen molecule; Pure oxygen; O2; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)

SDS # : 001043

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : OXIDIZING GASES - Category 1
GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause or intensify fire; oxidizer.
Contains gas under pressure; may explode if heated.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service.

Prevention : Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves, valves and fittings free from oil and grease.

Response : In case of fire: Stop leak if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : oxygen

Other means of identification : Molecular oxygen; Oxygen molecule; Pure oxygen; O2; UN 1072; Dioxygen; Oxygen USP, Aviator's Breathing Oxygen (ABO)

CAS number/other identifiers

CAS number : 7782-44-7

Product code : 001043

Ingredient name	%	CAS number
oxygen	100	7782-44-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Oxidizing material. This material increases the risk of fire and may aid combustion. Contact with combustible material may cause fire. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : No specific data.

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Section 7. Handling and storage

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves free from grease and oil. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Separate from acids, alkalies, reducing agents and combustibles. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

oxygen	None.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Section 8. Exposure controls/personal protection

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless. Blue.

Molecular weight : 32 g/mole

Molecular formula : O2

Boiling/condensation point : -183°C (-297.4°F)

Melting/freezing point : -218.4°C (-361.1°F)

Critical temperature : -118.15°C (-180.7°F)

Odor : Odorless.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials and organic materials.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : 1.1 (Air = 1)

Specific Volume (ft^3/lb) : 12.0482

Gas Density (lb/ft^3) : 0.083

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.65

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Section 10. Stability and reactivity

Possibility of hazardous reactions : Hazardous reactions or instability may occur under certain conditions of storage or use.
Conditions may include the following:
contact with combustible materials
Reactions may include the following:
risk of causing fire

Conditions to avoid : No specific data.

Incompatible materials : Highly reactive or incompatible with the following materials:
combustible materials
reducing materials
grease
oil

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity
Not available.

Irritation/Corrosion
Not available.

Sensitization
Not available.

Mutagenicity
Not available.

Carcinogenicity
Not available.

Reproductive toxicity
Not available.

Teratogenicity
Not available.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)
Not available.

Aspiration hazard
Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
oxygen	0.65	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1072	UN1072	UN1072	UN1072	UN1072
UN proper shipping name	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED	OXYGEN, COMPRESSED
Transport hazard class(es)	2.2 (5.1) 	2.2 	2.2 (5.1) 	2.2 (5.1) 	2.2 (5.1) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** A52	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.23-2.25 (Class 5). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** 50 **Passenger Carrying Road or Rail Index** 75 **Special provisions** 42	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: This material is listed or exempted.
United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
oxygen	100	No.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : Not determined.
Malaysia : Not determined.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.
Taiwan : This material is listed or exempted.

Section 15. Regulatory information

Canada

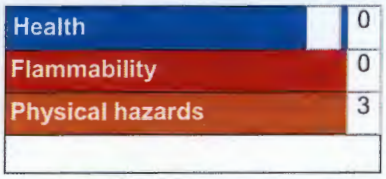
WHMIS (Canada) : Class A: Compressed gas.
Class C: Oxidizing material.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class C: Oxidizing material.

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Ox. Gas 1, H270 Press. Gas Comp. Gas, H280	Expert judgment According to package

History

Date of printing : 8/26/2015

Date of issue/Date of revision : 8/26/2015

Date of previous issue : No previous validation

Version : 0.01

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Airgas

Propane

Section 1. Identification

GHS product identifier : Propane

Chemical name : propane

Other means of identification : Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.

Product use : Synthetic/Analytical chemistry.

Synonym : Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.

SDS # : 001045

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May form explosive mixtures in Air.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Section 2. Hazards identification

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : propane

Other means of identification : Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.

CAS number/other identifiers

CAS number : 74-98-6

Product code : 001045

Ingredient name	%	CAS number
Propane	100	74-98-6

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Section 4. First aid measures

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Section 6. Accidental release measures

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Propane	**NIOSH REL (United States, 10/2013).** TWA: 1800 mg/m³ 10 hours. TWA: 1000 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 1800 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 1800 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 44.11 g/mole

Molecular formula : C3-H8

Boiling/condensation point : -161.48°C (-258.7°F)

Melting/freezing point : -187.6°C (-305.7°F)

Critical temperature : 96.55°C (205.8°F)

Odor : Odorless.BUT MAY HAVE SKUNK ODOR ADDED.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -104°C (-155.2°F)
Open cup: -104°C (-155.2°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 8.4%

Vapor pressure : 109 (psig)

Vapor density : 1.6 (Air = 1)

Section 9. Physical and chemical properties

Specific Volume (ft ³/lb) : 8.6206

Gas Density (lb/ft ³) : 0.116 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.0244 g/l

Partition coefficient: n-octanol/water : 1.09

Auto-ignition temperature : 287°C (548.6°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

IDLH : 2100 ppm

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Section 11. Toxicological information

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Propane	1.09	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1978	UN1978	UN1978	UN1978	UN1978
UN proper shipping name	PROPANE	PROPANE	PROPANE	PROPANE	PROPANE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000	-	-	**Passenger and Cargo Aircraft** Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

Section 14. Transport information

		Passenger Carrying Ship Index 65 Passenger Carrying Road or Rail Index Forbidden Special provisions 29, 42			

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: propane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Propane	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

Section 15. Regulatory information

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 10/20/2015

Date of issue/Date of revision : 10/20/2015

Date of previous issue : No previous validation

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Other special considerations : The information below is given to call attention to the issue of "Naturally occurring radioactive materials". Although Radon-222 levels in the product represented by this MSDS do not present any direct Radon exposure hazard, customers should be aware of the potential for Radon daughter build up within their processing systems, whatever the source of their product streams. Radon-222 is a naturally occurring radioactive gas which can be a contaminant in natural gas. During subsequent processing , Radon tends to be concentrated in Liquefied Petroleum Gas streams and in product streams having a similar boiling point range. Industry experience has shown that this product may contain small amounts of Radon-222 and its radioactive decay products, called Radon "daughters". The actual concentration of Radon-222 and radioactive daughters in the delivered product is dependent on the geographical source of the natural gas and storage time prior to delivery. Process equipment (i.e. lines, filters, pumps and reaction units) may accumulate significant levels of radioactive daughters and show a gamma radiation reading during operation. A potential external radiation hazard exists at or near any pipe valve or vessel containing a Radon enriched stream, or containing internal deposits of radioactive material due to the transmission of gamma radiation through its wall. Field studies reported in the literature have not shown any conditions that subject workers to cumulative exposures in excess of general population limits. Equipment emitting gamma radiation should be presumed to be internally contaminated with alpha emitting decay products which may be a hazard if inhaled or ingested. Protective equipment such as coveralls, gloves, and respirator (NIOSH/MHSA approved for high efficiency particulates and radionuclides, or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination, ingestion, or inhalation of any residues containing alpha radiation. Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Notice to reader

Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

ArrowForge 69

Steel Forging Compound

AQMD Super Compliant

Chem Arrow Corporation
13643 Live Oak Lane
Irwindale, CA 91706
USA

Tel: +1-626-358-2255
Fax: +1-626-359-8190
www.chemarrow.com

Emergency Contact Information:
Chem Tel Inc.
Tel: 1-800-255-3924 (North America)
Tel: +1-813-248-0585 (All other countries)

SECTION 2: HAZARDS IDENTIFICATION

GHS Ratings:

Oral toxicity	Acute Tox. 4	Oral>300+<=2000mg/kg
Skin corrosive	2	Reversible adverse effects in dermal tissue, Draize score: >= 2.3 < 4.0 or persistent inflammation
Eye corrosive	2A	Eye irritant: Subcategory 2A, Reversible in 21 days

GHS Hazards

H302	Harmful if swallowed
H315	Causes skin irritation
H319	Causes serious eye irritation

GHS Precautions

P264	Wash skin thoroughly after handling
P270	Do not eat, drink or smoke when using this product
P280	Wear protective gloves/protective clothing/eye protection/face protection
P321	Specific treatment (see First Aid section on this label/SDS)
P330	Rinse mouth
P362	Take off contaminated clothing and wash before reuse
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302+P352	IF ON SKIN: Wash with soap and water
P305+P351+P338	IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing
P332+P313	If skin irritation occurs: Get medical advice/attention
P337+P313	Get medical advice/attention
P501	Dispose of contents/container based on Local, State and Federal Regulations

Warning

SECTION 3: COMPOSITION INFORMATION ON CLASSIFIED INGREDIENTS

Component/Chemical Name	CAS No.	Weight Concentration %
Trade secret		10.00% - 20.00%
Sodium hydroxide	1310-73-2	5.00% - 10.00%

The specific identity and exact concentration of any included proprietary ingredient is withheld as a trade secret.

SECTION 4: FIRST AID MEASURES

Inhalation: If inhalation occurs, move the exposed person to fresh air. Avoid further inhalation and seek medical attention.

Eye Contact: In case of eye contact, flush the eyes with water for fifteen (15) minutes. If contact lenses are worn, quickly remove them, then flush the eyes with water. If irritation develops seek medical attention.

Skin Contact: In case of skin contact, remove contaminated clothing. Flush the skin with large amounts of water, then wash the skin with soap and water. If redness or irritation develops, seek medical attention.

Ingestion: If material is ingested, seek immediate medical attention. If vomiting occurs spontaneously, keep the head below the hips to prevent aspiration of liquid into the lungs.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Haz Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide and other organic compounds will be evolved when the material undergoes combustion.

Fire Fighting Instructions: This material will burn. For fires involving this material, do not enter any enclosed or confined fire space without protective equipment including self-contained breathing apparatus .

Fire Classification: OSHA Classification (29 CFR 1910.1200). Not classified by OSHA as flammable.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do so without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent

materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Follow Local, State and Federal authority's regulations for reporting spills.

SECTION 7: HANDLING AND STORAGE

General Handling Information: Avoid contaminating soil or releasing this product into sewage, drainage system and bodies of water.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity or other sources of ignition. Empty containers should be completely drained, properly closed and promptly returned to a drum reconditioner or disposed of properly.

Storage Conditions: Store in dry indoor area, preferably under mild temperature conditions. Store in original packaging. Keep container tightly closed when not in use. Avoid freezing.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name / CAS No.	OSHA Exposure Limits	ACGIH Exposure Limits	Other Exposure Limits
Trade secret	None reported	5 mg/m3 TWA	None reported
Sodium hydroxide 1310-73-2	2 mg/m3 TWA	2 mg/m3 Ceiling	NIOSH: 2 mg/m3 Ceiling

Engineering Controls: Use in a well ventilated area.

General Considerations: Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, Viton .

Respiratory Protection: No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: The data below are typical values and do not constitute a specification.

Appearance: Blue

Physical State: Liquid

Odor: Rose

Odor Threshold: Unknown

Vapor Pressure: Not determined

Vapor Density: Not determined

pH: 9 +/- 0.5

Specific Gravity: 1.113

Viscosity: Not determined

Freezing Point: 0 C / 32 F

Solubility: Water

Flash Point: N/A

Evaporation Rate: Unknown

Flammability Unknown

Explosive Limits: 0%

Partition Coefficient (n-octanol/water): Unknown

Decomposition Temperature: Unknown

VOC (Concentrate) Grams/Liter: 0

Boiling Range: 100°C

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition Products: None known (None expected).

SECTION 11: TOXICOLOGICAL INFORMATION

Mixture Toxicity

Oral Toxicity LD50: 134mg/kg

Component Toxicity (if applicable)

1310-73-2 Sodium hydroxide

Dermal LD50: 1,350 mg/kg (Rabbit)

Carcinogenicity: The following chemicals comprise 0.1% or more of this mixture and are listed and/or classified as carcinogens or potential carcinogens by NTP, IARC, OSHA (mandatory listing), or ACGIH (optional listing).

CAS Number	Description	% Weight	Carcinogen Rating
None			No data found

SECTION 12: ECOLOGICAL INFORMATION

Component Ecotoxicity

Trade secret	96 Hr LC50 Pimephales promelas: 97 mg/L [static] 48 Hr EC50 Daphnia magna: 85.7 mg/L 72 Hr EC50 Desmodesmus subspicatus: 31.3 mg/L; 96 Hr EC50 Desmodesmus subspicatus: 26.6 mg/L
Sodium hydroxide	96 Hr LC50 Oncorhynchus mykiss: 45.4 mg/L [static]

SECTION 13: DISPOSAL CONSIDERATION

Follow Local, State and Federal regulations regarding disposal.

SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Agency	Proper Shipping Name	UN Number	Packing Group	Hazard Class
DOT	N.O.I.B.N.; NOT REGULATED AS A HAZARDOUS MATERIAL UNDER 49 CFR.			
IATA	NOT REGULATED AS DANGEROUS GOODS			
IMDG	NOT REGULATED AS DANGEROUS GOODS			

SECTION 15: REGULATORY INFORMATION

Regulatory lists searched:

Country	Regulation	All Components Listed
US	California Prop 65	No
CA	Canada DSL	No
US	CERCLA	No
CN	China Inventory (IECSC)	No
EU	EINECS	No
MY	Malaysia Inventory (EHS Register)	No
US	SARA 311/312	No
US	TSCA	No

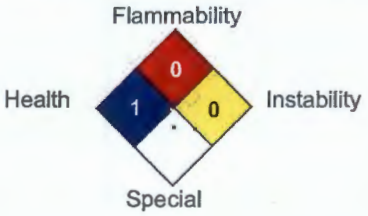
SECTION 16: OTHER INFORMATION

Hazardous Material Information System (HMIS)

HEALTH	1
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	

HMIS & NFPA Hazard Rating Legend
*** = Chronic Health Hazard**
0 = INSIGNIFICANT
1 = SLIGHT
2 = MODERATE
3 = HIGH

National Fire Protection Association (NFPA)



Date Prepared: 7/27/16

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since

data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

ArrowForge 322-B

Steel Forging Compound

AQMD Super Compliant

Chem Arrow Corporation
13643 Live Oak Lane
Irwindale, CA 91706
USA

Tel: +1-626-358-2255
Fax: +1-626-359-8190
www.chemarrow.com

Emergency Contact Information:
Chem Tel Inc.
Tel: 1-800-255-3924 (North America)
Tel: +1-813-248-0585 (all other countries)

SECTION 2: HAZARDS IDENTIFICATION

GHS Ratings:

Oral Toxicity	Acute Tox. 4	Oral>300+<=2000mg/kg
Carcinogen	1A	Known Human Carcinogen Based on human evidence

GHS Hazards

H302	Harmful if swallowed
H350	May cause cancer

GHS Precautions

P201	Obtain special instructions before use
P202	Do not handle until all safety precautions have been read and understood
P264	Wash thoroughly after handling
P270	Do not eat, drink or smoke when using this product
P281	Use personal protective equipment as required
P330	Rinse mouth
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P308+P313	IF exposed or concerned: Get medical advice/attention
P405	Store locked up
P501	Dispose of contents/container based on Local, State and Federal Regulations

Danger

SECTION 3: COMPOSITION INFORMATION ON CLASSIFIED INGREDIENTS

Component/Chemical Name	CAS No.	Weight Concentration %
Graphite	7782-42-5	
Sodium tetraborate decahydrate	1303-96-4	5.00% - 10.00%
Quartz	14808-60-7	0.10% - 1.00%

The specific identity and exact concentration of any included proprietary ingredient is withheld as a trade secret.

SECTION 4: FIRST AID MEASURES

Inhalation: If inhalation occurs, move the exposed person to fresh air. Avoid further inhalation and seek medical attention.

Eye Contact: In case of eye contact, flush the eyes with water for fifteen (15) minutes. If contact lenses are worn, quickly remove them, then flush the eyes with water. If irritation develops seek medical attention.

Skin Contact: In case of skin contact, remove contaminated clothing. Flush the skin with large amounts of water, then wash the skin with soap and water. If redness or irritation develops, seek medical attention.

Ingestion: If material is ingested, seek immediate medical attention. If vomiting occurs spontaneously, keep the head below the hips to prevent aspiration of liquid into the lungs.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Haz Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide and other organic compounds will be evolved when the material undergoes combustion.

Fire Fighting Instructions: This material will burn. For fires involving this material, do not enter any enclosed or confined fire space without protective equipment including self-contained breathing apparatus.

Fire Classification: OSHA Classification (29 CFR 1910.1200). Not classified by OSHA as flammable.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do so without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent

materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Follow Local, State and Federal authority's regulations for reporting spills.

SECTION 7: HANDLING AND STORAGE

General Handling Information: Avoid contaminating soil or releasing this product into sewage, drainage system and bodies of water.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity or other sources of ignition. Empty containers should be completely drained, properly closed and promptly returned to a drum reconditioner or disposed of properly.

Storage Conditions: Store in dry indoor area, preferably under mild temperature conditions. Store in original packaging. Keep container tightly closed when not in use. Avoid freezing.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name / CAS No.	OSHA Exposure Limits	ACGIH Exposure Limits	Other Exposure Limits
Graphite 7782-42-5	15 mg/m3 TWA (synthetic, total dust); 5 mg/m3 TWA (synthetic, respirable fraction)	2 mg/m3 TWA (all forms except graphite fibers, respirable fraction)	NIOSH: 2.5 mg/m3 TWA (natural, respirable dust)
Sodium tetraborate decahydrate 1303-96-4	None reported	6 mg/m3 STEL (inhalable fraction, listed under Borate compounds, inorganic) 2 mg/m3 TWA (inhalable fraction, listed under Borate compounds, inorganic)	NIOSH: 5 mg/m3 TWA
Quartz 14808-60-7	None reported	0.025 mg/m3 TWA (respirable fraction)	NIOSH: 0.05 mg/m3 TWA (respirable dust)

Engineering Controls: Use in a well ventilated area.

General Considerations: Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required. If user operations generate an oil mist,

determine if airborne concentrations are below the occupational exposure limit. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: The data below are typical values and do not constitute a specification.

Appearance: Black

Odor: Mild

Physical State: Smooth, semi-paste

Vapor Pressure: Not determined

Odor Threshold: Unknown

Vapor Density: Not determined

pH: 7.5 – 8.0

Specific Gravity: 1.2

Viscosity: N/A

Freezing Point: 30 F / -1.11 C

Solubility: Water

Boiling Range: 100°C

Flash Point: N/A

Evaporation Rate: N/A

Flammability Unknown

Explosive Limits: 0%

Partition Coefficient (n-octanol/water): Unknown

Autoignition Temperature: N/A

Decomposition Temperature: Unknown

VOC (Concentrate) Grams/Liter: 1.85

SECTION 10: STABILITY AND REACTIVITY

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition Products: None known (None expected).

SECTION 11: TOXICOLOGICAL INFORMATION

Mixture Toxicity

Oral Toxicity LD50: 141mg/kg

Component Toxicity (if applicable)

Carcinogenicity: The following chemicals comprise 0.1% or more of this mixture and are listed and/or classified as carcinogens or potential carcinogens by NTP, IARC, OSHA (mandatory listing), or ACGIH (optional listing).

CAS Number	Description	% Weight	Carcinogen Rating
14808-60-7	Quartz	0.1 to 1.0%	Quartz: NIOSH: potential occupational carcinogen IARC: Human carcinogen OSHA: listed

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: No data has been established.

Ready Biodegradability: This material is not expected to be readily biodegradable.

Component Ecotoxicity

SECTION 13: DISPOSAL CONSIDERATION

Follow Local, State and Federal regulations regarding disposal.

SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Agency	Proper Shipping Name	UN Number	Packing Group	Hazard Class
DOT	N.O.I.B.N.; NOT REGULATED AS A HAZARDOUS MATERIAL UNDER 49 CFR.			
IMDG	NOT REGULATED AS DANGEROUS GOODS			
IATA	NOT REGULATED AS DANGEROUS GOODS			

SECTION 15: REGULATORY INFORMATION

Country	Regulation	All Components Listed
US	California Prop 65	No
CA	Canada DSL	No
US	CERCLA	No
CN	China Inventory (IECSC)	Yes
EU	EINECS	No
MY	Malaysia Inventory (EHS Register)	No
US	SARA 311/312	No
US	TSCA	Yes

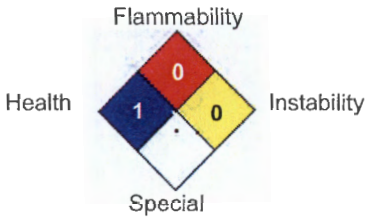
SECTION 16: OTHER INFORMATION

Hazardous Material Information System (HMIS)

National Fire Protection Association (NFPA)

HEALTH	1
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	

HMIS & NFPA Hazard Rating Legend
*** = Chronic Health Hazard**
0 = INSIGNIFICANT
1 = SLIGHT
2 = MODERATE
3 = HIGH



Date Prepared: 6/8/15

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

ArrowLube 604

AW HYDRAULIC OIL ISO 68

AQMD Super Compliant

Chem Arrow Corporation
13643 Live Oak Lane
Irwindale, CA 91706
USA

Tel: +1-626-358-2255
Fax: +1-626-359-8190
www.chemarrow.com

Emergency Contact Information:
Chem Tel Inc.
Tel: 1-800-255-3924 (North America)
Tel: +1-813-248-0585 (All other countries)

SECTION 2: HAZARDS IDENTIFICATION

GHS Ratings:

GHS Hazards	GHS Precautions

There are no GHS ratings that apply to this product at this time.

SECTION 3: COMPOSITION INFORMATION ON CLASSIFIED INGREDIENTS

Component/Chemical Name	CAS No.	Weight Concentration %
Lubricating oils, petroleum, hydrotreated spent	64742-58-1	80.00% - 90.00%
Residual oils, petroleum, solvent-dewaxed	64742-62-7	5.00% - 10.00%
Residual oils, petroleum, hydrotreated	64742-57-0	5.00% - 10.00%

The specific identity and exact concentration of any included proprietary ingredient is withheld as a trade secret.

SECTION 4: FIRST AID MEASURES

Inhalation: If inhalation occurs, move the exposed person to fresh air. Avoid further inhalation and seek medical attention.

Eye Contact: In case of eye contact, flush the eyes with water for fifteen (15) minutes. If contact lenses are worn, quickly remove them, then flush the eyes with water. If irritation develops seek medical attention.

Skin Contact: In case of skin contact, remove contaminated clothing. Flush the skin with large amounts of water, then wash the skin with soap and water. If redness or irritation develops, seek medical attention.

Ingestion: If material is ingested, seek immediate medical attention. If vomiting occurs spontaneously, keep the head below the hips to prevent aspiration of liquid into the lungs.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Haz Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide and other organic compounds will be evolved when the material undergoes combustion.

Fire Fighting Instructions: This material will burn. For fires involving this material, do not enter any enclosed or confined fire space without protective equipment including self-contained breathing apparatus .

SECTION 6: ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do so without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Follow Local, State and Federal authority's regulations for reporting spills.

SECTION 7: HANDLING AND STORAGE

General Handling Information: Avoid contaminating soil or releasing this product into sewage, drainage system and bodies of water.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity or other sources of ignition. Empty containers should be completely drained, properly closed and promptly returned to a drum reconditioner or disposed of properly.

Storage Conditions: Store in dry indoor area, preferably under mild temperature conditions. Store in original packaging. Keep container tightly closed when not in use. Avoid freezing.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name / CAS No.	OSHA Exposure Limits	ACGIH Exposure Limits	Other Exposure Limits
Lubricating oils, petroleum, hydrotreated spent 64742-58-1	PEL/TWA - 5 mg/m3	TLV/TWA - 5 mg/m3 TLV/STEL 10 mg/m3	CAL OSHA TWA - 5mg/m3

Residual oils, petroleum, solvent-dewaxed 64742-62-7	PEL/TWA - 5 mg/m3 (8 hrs)	TLV/TWA - 5 mg/m3 (8 hrs) Form: Inhalable fraction	NIOSH REL/TWA - 5 mg/m3 (10 hrs) Form: Mist NIOSH REL/STEL - 10 mg/m3 (15 min) Form: Mist
Residual oils, petroleum, hydrotreated 64742-57-0	None reported	None reported	None reported

Engineering Controls: Use in a well ventilated area.

General Considerations: Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, Viton .

Respiratory Protection: No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: The data below are typical values and do not constitute a specification .

Appearance: Amber clear

Odor: Petroleum

Physical State: Liquid

Vapor Pressure: Not determined

Odor Threshold: Unknown

Vapor Density: Not determined

pH: Not determined

API Gravity: 27.1

Specific Gravity: 0.88

Viscosity SUS @ 100 F: 300

Freezing Point: N/A

Solubility: Oil

Boiling Range: 260 - 281°C

Flash Point: 385 F,196 C

Evaporation Rate: N/A

Flammability Unknown

Explosive Limits: 0%

Partition Coefficient (n-octanol/water): Unknown

Autoignition Temperature: N/A

Decomposition Temperature: Unknown

VOC (Concentrate) Grams/Liter: 17.32

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: Avoid contact with: Strong oxidizers, strong acids.

Conditions to Avoid: Extreme temperatures, open flames.

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition Products: None known (None expected).

SECTION 11: TOXICOLOGICAL INFORMATION

Mixture Toxicity

Inhalation Toxicity LC50: 22mg/L

Component Toxicity (if applicable)

Carcinogenicity: The following chemicals comprise 0.1% or more of this mixture and are listed and/or classified as carcinogens or potential carcinogens by NTP, IARC, OSHA (mandatory listing), or ACGIH (optional listing).

CAS Number	Description	% Weight	Carcinogen Rating
None			No data found

SECTION 12: ECOLOGICAL INFORMATION

Component Ecotoxicity

Lubricating oils, petroleum, hydrotreated spent	96 Hr LC50 Brachydanio rerio: 79.6 mg/L [semi-static]; 96 Hr LC50 Pimephales promelas: 3.2 mg/L [semi-static]
Residual oils, petroleum, solvent-dewaxed	96 Hr LC50 Oncorhynchus mykiss: >5000 mg/L 48 Hr EC50 Daphnia magna: >1000 mg/L

SECTION 13: DISPOSAL CONSIDERATION

Follow Local, State and Federal regulations regarding disposal.

SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Agency	Proper Shipping Name	UN Number	Packing Group	Hazard Class
DOT	PETROLEUM OIL, N.O.I.B.N.; NOT REGULATED AS A HAZARDOUS MATERIAL UNDER 49 CFR.			
IATA	NOT REGULATED AS DANGEROUS GOODS			
IMDG	NOT REGULATED AS DANGEROUS GOODS			

SECTION 15: REGULATORY INFORMATION

Regulatory lists searched:

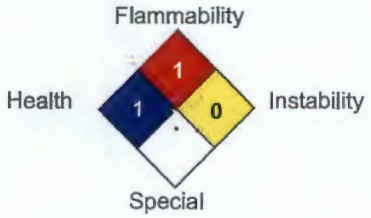
Country	Regulation	All Components Listed
US	California Prop 65	No
CA	Canada DSL	No
US	CERCLA	No
CN	China Inventory (IECSC)	Yes
EU	EINECS	Yes
MY	Malaysia Inventory (EHS Register)	No
US	SARA 311/312	No
US	TSCA	Yes

SECTION 16: OTHER INFORMATION

Hazardous Material Information System (HMIS)

HMIS & NFPA Hazard Rating Legend
*** = Chronic Health Hazard**
0 = INSIGNIFICANT
1 = SLIGHT
2 = MODERATE
3 = HIGH

National Fire Protection Association (NFPA)



Date Prepared: 12/14/2016

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

SAFETY DATA SHEET

Issue Date 28-May-2015 **Revision Date** 12-Oct-2015 **Version** 3

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name Nickel-Base Alloys

Other means of identification

Product Code SM001

Synonyms Non-powder forms of A905L™ Alloy, ATI 10242™ Alloy, ATI 120™ Alloy, Rene 88DT, ATI 188™ Alloy, ATI 200™ Alloy, ATI 201™ Alloy, ATI 22™ Alloy, ATI 235™ Alloy, ATI 2535™ Alloy, ATI 2550™ Alloy, ATI 35N LoTi™ Alloy, ATI 35N™ Alloy, ATI 400™ Alloy, ATI 42™ Alloy, ATI 500 ZB™ Alloy, ATI 520™ Alloy, ATI 600™ Alloy, ATI 617™ Alloy, ATI 6230™ Alloy, ATI 625 Lo-Fe™ Alloy, ATI 625™ Alloy, ATI 690™ Alloy, ATI 700™ Alloy, ATI 706™ Alloy, ATI 718-OP® Alloy, ATI 718Plus® Alloy, ATI 718™ Alloy, ATI 720™ Alloy, ATI 800™ Alloy, ATI 80A™ Alloy, ATI 825™ Alloy, ATI 901™ Alloy, ATI 903™ Alloy, ATI 909™ Alloy, ATI 925™ Alloy, ATI A286™ Alloy, ATI ASTROLOY™ Alloy, ATI C-263™ Alloy, ATI C-276™ Alloy, ATI Gator Waspaloy* Alloy (* a Trademark of Pratt & Whitney), ATI GTD-222™ Alloy, ATI HB-2™ Alloy, ATI HG™ Alloy, ATI HN™ Alloy, ATI HS™ Alloy, ATI HX™ Alloy, ATI K-500™ Alloy, ATI L-605™ Alloy, ATI M-252™ Alloy, ATI MOLY PERMALLOY™ Alloy, ATI N-90™ Alloy, ATI P-31™ Alloy, ATI PE-16™ Alloy, ATI R26™ Alloy, ATI Super Waspaloy* Alloy (* a Trademark of Pratt & Whitney), ATI W-722™ Alloy, ATI X-750™ Alloy, ATI X-751™ Alloy, ATI X-849™ Alloy, Rene 41™ Alloy, Rene 65™ DT Alloy, RENE 88 Alloy, RR1000* (* a Trademark of Rolls-Royce plc), TJA-1537® Hi-Carb Alloy, TJA-1537® Lo-Carb Alloy, Waspaloy* Alloy (* a Trademark of Pratt & Whitney)

Recommended use of the chemical and restrictions on use

Recommended Use Nickel alloy product manufacture.

Uses advised against

Details of the supplier of the safety data sheet

Manufacturer Address

ATI, 1000 Six PPG Place, Pittsburgh, PA
15222 USA

Emergency telephone number

Emergency Telephone Chemtrec: 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200) This product is an article and, as such, does not present a hazard to human health by inhalation or ingestion

Acute toxicity - Oral	Category 4
Respiratory sensitization	Category 1B
Skin sensitization	Category 1
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 2
Chronic aquatic toxicity	Category 4

Label elements

Emergency Overview

Danger

Hazard statements
May cause long lasting harmful effects to aquatic life
Harmful if swallowed
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause an allergic skin reaction
May cause cancer
Suspected of damaging fertility or the unborn child
Causes damage to the respiratory tract through prolonged or repeated exposure if inhaled

Appearance Various massive product forms **Physical state** Solid **Odor** Odorless

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wear protective gloves

If skin irritation or rash occurs: Get medical advice/attention
If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Not applicable
Other Information
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, zinc, copper, magnesium, or cadmium fumes may cause metal fume fever, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms

Non-powder forms of A905L™ Alloy, ATI 10242™ Alloy, ATI 120™ Alloy, Rene 88DT, ATI 188™ Alloy, ATI 200™ Alloy, ATI 201™ Alloy, ATI 22™ Alloy, ATI 235™ Alloy, ATI 2535™ Alloy, ATI 2550™ Alloy, ATI 35N LoTi™ Alloy, ATI 35N™ Alloy, ATI 400™ Alloy, ATI 42™ Alloy, ATI 500 ZB™ Alloy, ATI 520™ Alloy, ATI 600™ Alloy, ATI 617™ Alloy, ATI 6230™ Alloy, ATI 625 Lo-Fe™ Alloy, ATI 625™ Alloy, ATI 690™ Alloy, ATI 700™ Alloy, ATI 706™ Alloy, ATI 718-OP® Alloy, ATI 718Plus® Alloy, ATI 718™ Alloy, ATI 720™ Alloy, ATI 800™ Alloy, ATI 80A™ Alloy, ATI 825™ Alloy, ATI 901™ Alloy, ATI 903™ Alloy, ATI 909™ Alloy, ATI 925™ Alloy, ATI A286™ Alloy, ATI ASTROLOY™ Alloy, ATI C-263™ Alloy, ATI C-276™ Alloy, ATI Gator Waspaloy* Alloy (* a Trademark of Pratt & Whitney), ATI GTD-222™ Alloy, ATI HB-2™ Alloy, ATI HG™ Alloy, ATI HN™ Alloy, ATI HS™ Alloy, ATI HX™ Alloy, ATI K-500™ Alloy, ATI L-605™ Alloy, ATI M-252™ Alloy, ATI MOLY PERMALLOY™ Alloy, ATI N-90™ Alloy, ATI P-31™ Alloy, ATI PE-16™ Alloy, ATI R26™ Alloy, ATI Super Waspaloy* Alloy (* a Trademark of Pratt & Whitney), ATI W-722™ Alloy, ATI X-750™ Alloy, ATI X-751™ Alloy, ATI X-849™ Alloy, Rene 41™ Alloy, Rene 65™ DT

Alloy, RENE 88 Alloy, RR1000* (* a Trademark of Rolls-Royce plc), TJA-1537® Hi-Carb Alloy, TJA-1537® Lo-Carb Alloy, Waspaloy* Alloy (* a Trademark of Pratt & Whitney).

Chemical Name	CAS No.	Weight-%
Nickel	7440-02-0	30 - 100
Iron	7439-89-6	0 - 42
Chromium	7440-47-3	0 - 35
Cobalt	7440-48-4	0 - 35
Copper	7440-50-8	0 - 35
Molybdenum	7439-98-7	0 - 26
Tungsten	7440-33-7	0 - 16
Niobium (Columbium)	7440-03-1	0 - 6
Tantalum	7440-25-7	0 - 5
Titanium	7440-32-6	0 - 5
Aluminum	7429-90-5	0 - 5
Manganese	7439-96-5	0 - 5

4. FIRST AID MEASURES

First aid measures

Eye contact In the case of particles coming in contact with eyes during processing, treat as with any foreign object.

Skin Contact In the case of skin irritation or allergic reactions see a physician.

Inhalation If excessive amounts of vapors, smoke, fume, or particles are inhaled during processing, remove to fresh air and consult a qualified health professional.

Ingestion Not an expected route of exposure.

Most important symptoms and effects, both acute and delayed

Symptoms May cause allergic skin reaction. May cause acute gastrointestinal effects if swallowed.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Smother with salt (NaCl) or class D dry powder fire extinguisher.

Unsuitable extinguishing media Do not spray water on burning metal as an explosion may occur. This explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material.

Specific hazards arising from the chemical

Intense heat. Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

Hazardous combustion products Titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Zinc, copper, magnesium, or cadmium fumes may cause metal fumes fever, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH approved (or equivalent) respirator and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Use personal protective equipment as required.

For emergency responders Use personal protective equipment as required.

Environmental precautions

Environmental precautions Not applicable to massive product.

Methods and material for containment and cleaning up

Methods for containment Not applicable to massive product.

Methods for cleaning up Not applicable to massive product.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep chips, turnings, dust, and other small particles away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity).

Incompatible materials Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following: Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Chemical Name	ACGIH TLV	OSHA PEL
Nickel 7440-02-0	TWA: 1.5 mg/m³ inhalable fraction	TWA: 1 mg/m³
Iron 7439-89-6	-	-
Chromium 7440-47-3	TWA: 0.5 mg/m³	TWA: 1 mg/m³
Cobalt 7440-48-4	TWA: 0.02 mg/m³ TWA: 0.02 mg/m³ Co	TWA: 0.1 mg/m³ dust and fume
Copper 7440-50-8	TWA: 0.2 mg/m³ fume TWA: 1 mg/m³ Cu dust and mist	TWA: 0.1 mg/m³ fume TWA: 1 mg/m³ dust and mist
Molybdenum 7439-98-7	TWA: 10 mg/m³ inhalable fraction TWA: 3 mg/m³ respirable fraction	-

Tungsten 7440-33-7	STEL: 10 mg/m³ STEL: 10 mg/m³ W TWA: 5 mg/m³ TWA: 5 mg/m³ W	(vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ W
Niobium (Columbium) 7440-03-1	-	-
Tantalum 7440-25-7	-	TWA: 5 mg/m³
Titanium 7440-32-6	-	-
Aluminum 7429-90-5	TWA: 1 mg/m³ respirable fraction	TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction
Manganese 7439-96-5	TWA: 0.02 mg/m³ respirable fraction TWA: 0.1 mg/m³ inhalable fraction TWA: 0.02 mg/m³ Mn TWA: 0.1 mg/m³ Mn	(vacated) STEL: 3 mg/m³ fume (vacated) Ceiling: 5 mg/m³ Ceiling: 5 mg/m³ fume Ceiling: 5 mg/m³ Mn

Appropriate engineering controls

Engineering Controls Avoid generation of uncontrolled particles.

Individual protection measures, such as personal protective equipment

Eye/face protection When airborne particles may be present, appropriate eye protection is recommended. For example, tight-fitting goggles, foam-lined safety glasses or other protective equipment that shield the eyes from particles.

Skin and body protection Fire/flame resistant/retardant clothing may be appropriate during hot work with the product. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present.

Respiratory protection When particulates/fumes/gases are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminat concentrations. Respiratory protection must be provided in accordance with current local regulations.

General Hygiene Considerations Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	Various massive product forms	**Odor**	Odorless
Color	metallic Grey silver	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
pH	Not Applicable	Not applicable
Melting point/freezing point	1420-1450 °C / 2590 to 2650 °F	
Boiling point / boiling range	-	Not applicable
Flash point	-	Not applicable
Evaporation rate	-	Not applicable
Flammability (solid, gas)	-	Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product
Flammability Limit in Air		
Upper flammability limit:	Not Applicable	
Lower flammability limit:	Not Applicable	
Vapor pressure	-	Not applicable
Vapor density	-	Not applicable
Specific Gravity	7-9 -	
Water solubility	Insoluble	Not applicable
Solubility in other solvents	-	Not applicable
Partition coefficient	-	Not applicable

Autoignition temperature	-	Not applicable
Decomposition temperature	-	Not applicable
Kinematic viscosity	-	Not applicable
Dynamic viscosity	-	Not applicable
Explosive properties	Not applicable	
Oxidizing properties	Not applicable	

Other Information

Softening point	Not Applicable
Molecular weight	Not Applicable
VOC Content (%)	Not applicable
Density	-
Bulk density	-

10. STABILITY AND REACTIVITY

Reactivity
Not applicable

Chemical stability
Stable under normal conditions.
Possibility of Hazardous Reactions
None under normal processing.
Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid
Dust formation and dust accumulation.
Incompatible materials
Dissolves in hydrofluoric acid. Ignites in the presence of fluorine. When heated above 200°C, reacts exothermically with the following: Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.
Hazardous Decomposition Products
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation Not an expected route of exposure for product in massive form.

Eye contact Not an expected route of exposure for product in massive form.

Skin Contact May cause sensitization by skin contact.

Ingestion Not an expected route of exposure for product in massive form.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Nickel 7440-02-0	> 9000 mg/kg bw	-	-
Iron 7439-89-6	98,600 mg/kg bw	-	> 0.25 mg/L
Copper 7440-50-8	481 mg/kg bw	>2000 mg/kg bw	>5.11 mg/L
Cobalt 7440-48-4	550 mg/kg bw	>2000 mg/kg bw	<0.05 mg/L
Chromium 7440-47-3	> 3400 mg/kg bw	-	> 5.41 mg/L

Molybdenum 7439-98-7	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.10 mg/L
Tungsten 7440-33-7	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.4 mg/L
Niobium (Columbium) 7440-03-1	-	> 2000 mg/kg bw	-
Titanium 7440-32-6	> 5000 mg/kg bw	-	-
Tantalum 7440-25-7	-	-	-
Manganese 7439-96-5	>2000 mg/kg bw	-	>5.14 mg/L
Aluminum 7429-90-5	15,900 mg/kg bw	-	> 1 mg/L

Information on toxicological effects

Symptoms May cause sensitization by skin contact. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause acute gastrointestinal effects if swallowed.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Acute toxicity Harmful if swallowed. Cobalt-containing powders may be fatal if inhaled.
Skin corrosion/irritation Product not classified.
Serious eye damage/eye irritation Product not classified.
Sensitization May cause sensitization by skin contact. Cobalt-containing alloys may cause sensitization by inhalation.
Germ cell mutagenicity Product not classified.
Carcinogenicity May cause cancer by inhalation.

Chemical Name	ACGIH	IARC	NTP	OSHA
Nickel 7440-02-0		Group 1 Group 2B	Known Reasonably Anticipated	X
Cobalt 7440-48-4	A3	Group 2A Group 2B	Known	X
Chromium 7440-47-3		Group 3		

Reproductive toxicity Possible risk of impaired fertility.
STOT - single exposure Product not classified.
STOT - repeated exposure Causes disorder and damage to the respiratory system.
Aspiration hazard Product not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity

This product as shipped is classified for aquatic chronic toxicity This product contains a chemical which is listed as a severe marine pollutant according to DOT

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Nickel 7440-02-0	NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus to 425 µg/l for Pseudokirchneriella subcapitata.	The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320 mg Ni/L for Brachydanio rerio.	The 30 min EC50 of nickel for activated sludge was 33 mg Ni/L.	The 48h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna.
Iron 7439-89-6	-	The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L.	The 3 h EC50 of iron oxide for activated sludge was greater than 10,000 mg/L.	The 48 h EC50 of iron oxide to Daphnia magna was greater than 100 mg/L.
Chromium 7440-47-3	-	-	-	-

Cobalt 7440-48-4	The 72 h EC50 of cobalt dichloride to Pseudokirchneriella subcapitata was 144 ug of Co/L.	The 96h LC50 of cobalt dichloride ranged from 1.5 mg Co/L for Oncorhynchus mykiss to 85 mg Co/L for Danio rerio.	The 3 h EC50 of cobalt dichloride for activated sludge was 120 mg of Co/L.	The 48 h LC50 of cobalt dichloride ranged from 0.61 mg Co/L for Ceriodaphnia dubia tested in soft, DOM-free water to >1800mg Co/L for Tubifex tubifex in very hard water.
Copper 7440-50-8	The 72 h EC50 values of copper chloride to Pseudokirchneriella subcapitata ranged between 30 µg/L (pH 7.02, hardness 250 mg/L CaCO3, DOC 1.95 mg/L) and 824 µg/L (pH 6.22, hardness 100 mg/L CaCO3, DOC 15.8 mg/L).	The 96-hr LC50 for Pimephales promelas exposed to Copper sulfate ranged from 256.2 to 38.4 ug/L with water hardness increasing from 45 to 255.7 mg/L.	The 24 h NOEC of copper chloride for activated sludge ranged from 0.32 to 0.64 mg of Cu/L.	The 48 h LC50 values for Daphnia magna exposed to copper in natural water ranged between 33.8 µg/L (pH 6.1, hardness 12.4 mg/L CaCO3, DOC 2.34 mg/L) and 792 µg/L (pH 7.35, hardness 139.7 mg/L CaCO3, DOC 22.8 mg/L).
Molybdenum 7439-98-7	The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L.	The 96 h LC50 of sodium molybdate dihydrate to Pimephales promelas was 644.2 mg/L	The 3 h EC50 of molybdenum trioxide for activated sludge was 820 mg/L.	The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L. The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L.
Tungsten 7440-33-7	The 72 h EC50 of sodium tungstate to Pseudokirchnerella subcapitata was 31.0 mg of W/L.	The 96 h LC50 of sodium tungstate to Danio rerio was greater than 106 mg of W/L.	The 30 min EC50 of sodium tungstate for activated sludge were greater than 1000 mg/L.	The 48 h EC50 of sodium tungstate to Daphnia magna was greater than 96 mg of W/L.
Niobium (Columbium) 7440-03-1	-	-	-	-
Tantalum 7440-25-7	-	-	-	-
Titanium 7440-32-6	The 72 h EC50 of titanium dioxide to Pseudokirchnerella subcapitata was 61 mg of TiO2/L.	The 96 h LC50 of titanium dioxide to Cyprinodon variegatus was greater than 10,000 mg of TiO2/L. The 96 h LC50 of titanium dioxide to Pimephales promelas was greater than 1,000 mg of TiO2/L .	The 3 h EC50 of titanium dioxide for activated sludge were greater than 1000 mg/L.	The 48 h EC50 of titanium dioxide to Daphnia Magna was greater than 1000 mg of TiO2/L.
Aluminum 7429-90-5	The 96-h EC50 values for reduction of biomass of Pseudokirchneriella subcapitata in AAP-Medium at pH 6, 7, and 8 were estimated as 20.1, 5.4, and 150.6 µg/L, respectively, for dissolved Al.	The 96 h LC50 of aluminum to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5	-	The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminium chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.
Manganese 7439-96-5	The 72 h EC50 of manganese to Desmodesmus subspicatus was 2.8 mg of Mn/L.	The 96 h LC50 of manganese to Oncorhynchus mykiss was greater than 3.6 mg of Mn/L	The 3 h EC50 of manganese for activated sludge was greater than 1000 mg/L.	The 48 h EC50 of manganese to Daphnia magna was greater than 1.6 mg/L.

Persistence and degradability

Bioaccumulation

Other adverse effects This product as shipped is not classified for acute environmental endpoints. However, when subjected to sawing or grinding, particles may be generated that are classified for aquatic acute toxicity.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging None anticipated.

Chemical Name	RCRA - D Series Wastes
Chromium 7440-47-3	5.0 mg/L regulatory level

This product contains one or more substances that are listed with the State of California as a hazardous waste.

14. TRANSPORT INFORMATION

DOT Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical Name	CAS No.	Weight-%	SARA 313 - Threshold Values %
Nickel - 7440-02-0	7440-02-0	30 - 100	0.1
Copper - 7440-50-8	7440-50-8	0 - 35	1.0
Cobalt - 7440-48-4	7440-48-4	0 - 35	0.1
Chromium - 7440-47-3	7440-47-3	0 - 35	1.0
Manganese - 7439-96-5	7439-96-5	0 - 5	1.0

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Nickel 7440-02-0		X	X	
Copper 7440-50-8		X	X	
Chromium 7440-47-3		X	X	

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Chemical Name	Hazardous Substances RQs
Nickel 7440-02-0	100 lb
Copper 7440-50-8	5000 lb
Chromium 7440-47-3	5000 lb

US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

Chemical Name	California Proposition 65
Nickel - 7440-02-0	Carcinogen
Cobalt - 7440-48-4	Carcinogen

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Nickel 7440-02-0	X	X	X
Copper 7440-50-8	X	X	X
Cobalt 7440-48-4	X	X	X
Chromium 7440-47-3	X	X	X
Molybdenum 7439-98-7	X	X	X
Tungsten 7440-33-7	X	X	X
Titanium 7440-32-6	X		
Tantalum 7440-25-7	X	X	X
Manganese 7439-96-5	X	X	X
Aluminum 7429-90-5	X	X	X

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

16. OTHER INFORMATION

NFPA	**Health hazards** 1	**Flammability** 0	**Instability** 0	**Physical and Chemical Properties** -
HMIS	**Health hazards** 2*	**Flammability** 0	**Physical hazards** 0	**Personal protection** X

** = Chronic Health Hazard*

Issue Date 28-May-2015
Revision Date 12-Oct-2015
Revision Note
Updated Section 2, 7, and 15

Note:

The information provided in this safety data sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in *the text*

End of Safety Data Sheet

Additional information available from: Safety data sheets and labels available at ATImetals.com

SAFETY DATA SHEET

Issue Date 28-May-2015 **Revision Date** 13-Oct-2015 **Version** 4

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name Titanium Base Alloys

Other means of identification

Product Code SM0003

Synonyms Non-powder forms of ATI 10-2-3™ Alloy, ATI 12-6-4™ Alloy, ATI 15Mo™ Alloy, ATI 17™ Alloy, ATI 21S™ Alloy, ATI 3-2.5™ Alloy, ATI 38-644™ Alloy, ATI 4.5-322™ Alloy, ATI 425® Alloy, ATI 4-4-2™ Alloy, ATI 48-2-2™ Alloy, ATI 5553™ Alloy, ATI 6-2222™ Alloy, ATI 6-2-4-2-Si PM™ Alloy, ATI 6-2-4-2™ Alloy, ATI 6-2-4-2CR™ Alloy, ATI 6-2-4-6™ Alloy, ATI 6-4 ELI™ Alloy, ATI 6-4™ Alloy, ATI 6-6-2™ Alloy, ATI 6-7™ Alloy, ATI 7-4™ Alloy, ATI 8-1-1™ Alloy, ATI CP Grade 1, ATI CP Grade 2, ATI CP Grade 4, ATI Gamma-TiAl, ATI Ti-32Al™, ATI Grade 12, ATI Grade 37, ATI Grade 7 , TMZF®* Alloy (* a Registered Trademark of Stryker Orthopaedics)

Recommended use of the chemical and restrictions on use

Recommended Use Titanium alloy product manufacture.

Uses advised against

Details of the supplier of the safety data sheet

Manufacturer Address

ATI, 1000 Six PPG Place, Pittsburgh, PA
15222 USA

Emergency telephone number

Emergency Telephone Chemtrec: 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label elements

Emergency Overview

Appearance Various massive product forms **Physical state** Solid **Odor** Odorless

Hazards not otherwise classified (HNOC)

Not applicable

Other Information

When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system, zinc, copper, magnesium, or cadmium fumes may cause metal fume fever, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms Non-powder forms of ATI 10-2-3™ Alloy, ATI 12-6-4™ Alloy, ATI 15Mo™ Alloy, ATI 17™ Alloy, ATI 21S™ Alloy, ATI 3-2.5™ Alloy, ATI 38-644™ Alloy, ATI 4.5-322™ Alloy, ATI 425® Alloy, ATI 4-4-2™ Alloy, ATI 48-2-2™ Alloy, ATI 5553™ Alloy, ATI 6-2222™ Alloy, ATI 6-2-4-2-Si PM™ Alloy, ATI 6-2-4-2™ Alloy, ATI 6-2-4-2CR™ Alloy, ATI 6-2-4-6™ Alloy, ATI 6-4 ELI™ Alloy, ATI 6-4™ Alloy, ATI 6-6-2™ Alloy, ATI 6-7™ Alloy, ATI 7-4™ Alloy, ATI 8-1-1™ Alloy, ATI CP Grade 1, ATI CP Grade 2, ATI CP Grade 4, ATI Gamma-TiAl, ATI Ti-32Al™, ATI Grade 12, ATI Grade 37, ATI Grade 7 , TMZF®* Alloy (* a Registered Trademark of Stryker Orthopaedics).

Chemical Name	CAS No.	Weight-%
Titanium	7440-32-6	50 - 100
Aluminum	7429-90-5	0 - 40
Molybdenum	7439-98-7	1 - 15
Chromium	7440-47-3	0 - 10
Niobium (Columbium)	7440-03-1	0 - 10
Vanadium	7440-62-2	0 - 10
Zirconium	7440-67-7	0 - 10
Tin	7440-31-5	0 - 5
Copper	7440-50-8	0 - 5
Iron	7439-89-6	0 - 5
Silicon	7440-21-3	0 - 1
Nickel	7440-02-0	0 - 0.9

4. FIRST AID MEASURES

First aid measures

Eye contact In the case of particles coming in contact with eyes during processing, treat as with any foreign object.

Skin Contact In the case of skin irritation or allergic reactions see a physician.

Inhalation If excessive amounts of smoke, fume, or particulate are inhaled during processing, remove to fresh air and consult a qualified health professional.

Ingestion Not an expected route of exposure.

Most important symptoms and effects, both acute and delayed

Symptoms May cause allergic skin reaction.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product. Smother with salt (NaCl) or class D dry powder fire extinguisher.

Unsuitable extinguishing media Do not spray water on burning metal as an explosion may occur. This explosive characteristic is caused by the hydrogen and steam generated by the reaction of water with the burning material.

Specific hazards arising from the chemical
Intense heat. Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

Hazardous combustion products Titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system, zinc, copper, magnesium, or cadmium fumes may cause metal fume fever. Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH approved (or equivalent) respirator and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Use personal protective equipment as required.

For emergency responders Use personal protective equipment as required.

Environmental precautions

Environmental precautions Not applicable to massive product.

Methods and material for containment and cleaning up

Methods for containment Not applicable to massive product.

Methods for cleaning up Not applicable to massive product.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Very fine, high surface area material resulting from grinding, buffing, polishing, or similar processes of this product may ignite spontaneously at room temperature. WARNING: Fine particles resulting from grinding, buffing, polishing, or similar processes of this product may form combustible dust-air mixtures. Keep particles away from all ignition sources including heat, sparks, and flame. Prevent dust accumulations to minimize combustible dust hazard.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep chips, turnings, dust, and other small particles away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity).

Incompatible materials Dissolves in hydrofluoric acid, Ignites in the presence of fluorine: When heated above 200°C, reacts exothermically with the following. Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL
Titanium 7440-32-6	-	-
Aluminum 7429-90-5	TWA: 1 mg/m³ respirable fraction	TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction
Molybdenum 7439-98-7	TWA: 10 mg/m³ inhalable fraction TWA: 3 mg/m³ respirable fraction	-
Chromium 7440-47-3	TWA: 0.5 mg/m³	TWA: 1 mg/m³
Niobium (Columbium) 7440-03-1	-	-
Vanadium 7440-62-2	-	Ceiling: 0.5 mg/m³ V2O5 respirable dust Ceiling: 0.1 mg/m³ V2O5 fume
Zirconium 7440-67-7	STEL: 10 mg/m³ STEL: 10 mg/m³ Zr TWA: 5 mg/m³ TWA: 5 mg/m³ Zr	TWA: 5 mg/m³ Zr (vacated) STEL: 10 mg/m³ (vacated) STEL: 10 mg/m³ Zr
Tin 7440-31-5	TWA: 2 mg/m³ TWA: 2 mg/m³ Sn except Tin hydride	TWA: 2 mg/m³ Sn except oxides
Copper 7440-50-8	TWA: 0.2 mg/m³ fume TWA: 1 mg/m³ Cu dust and mist	TWA: 0.1 mg/m³ fume TWA: 1 mg/m³ dust and mist
Iron 7439-89-6	-	-
Silicon 7440-21-3	-	TWA: 15 mg/m³ total dust TWA: 5 mg/m³ respirable fraction
Nickel 7440-02-0	TWA: 1.5 mg/m³ inhalable fraction	TWA: 1 mg/m³

Appropriate engineering controls

Engineering Controls Avoid generation of uncontrolled particles.

Individual protection measures, such as personal protective equipment

Eye/face protection When airborne particles may be present, appropriate eye protection is recommended. For example, tight-fitting goggles, foam-lined safety glasses or other protective equipment that shield the eyes from particles.

Skin and body protection Fire/flame resistant/retardant clothing may be appropriate during hot work with the product. Wear protective gloves. Cut-resistant gloves and/or protective clothing may be appropriate when sharp surfaces are present.

Respiratory protection When particulates/fumes/gases are generated and if exposure limits are exceeded or irritation is experienced, proper approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminat concentrations. Respiratory protection must be provided in accordance with current local regulations.

General Hygiene Considerations Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid		
Appearance	Various massive product forms	**Odor**	Odorless
Color	metallic, gray or silver	**Odor threshold**	Not applicable

Property	Values	Remarks • Method
pH	Not Applicable	
Melting point/freezing point	1540-1670 °C 2800-3000 °F	
Boiling point / boiling range	-	Not applicable
Flash point	-	Not applicable

Evaporation rate	-	Not applicable
Flammability (solid, gas)	-	Not flammable in the form of this product as distributed, flammable as finely divided particles or pieces resulting from processing of this product
Flammability Limit in Air		
Upper flammability limit:	Not Applicable	
Lower flammability limit:	Not Applicable	
Vapor pressure	-	Not applicable
Vapor density	-	Not applicable
Specific Gravity	4.5	
Water solubility	Insoluble	Insoluble
Solubility in other solvents	-	Not applicable
Partition coefficient	-	Not applicable
Autoignition temperature	-	Not applicable
Decomposition temperature	-	Not applicable
Kinematic viscosity	-	Not applicable
Dynamic viscosity	-	Not applicable
Explosive properties	Not applicable	
Oxidizing properties	Not applicable	

Other Information

Softening point	Not Applicable
Molecular weight	Not Applicable
VOC Content (%)	Not applicable
Density	-
Bulk density	-

10. STABILITY AND REACTIVITY

Reactivity
Not applicable

Chemical stability
Stable under normal conditions.
Possibility of Hazardous Reactions
None under normal processing.
Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid
Dust formation and dust accumulation.
Incompatible materials
Dissolves in hydrofluoric acid, Ignites in the presence of fluorine: When heated above 200°C, reacts exothermically with the following. Chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, and freon.
Hazardous Decomposition Products
When product is subjected to welding, burning, melting, sawing, brazing, grinding, buffing, polishing, or other similar heat-generating processes, the following potentially hazardous airborne particles and/or fumes may be generated: titanium dioxide an IARC Group 2B carcinogen, Hexavalent Chromium (Chromium VI) may cause lung, nasal, and/or sinus cancer. Vanadium pentoxide (V2O5) affects eyes, skin, respiratory system, Soluble molybdenum compounds such as molybdenum trioxide may cause lung irritation.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation	Not an expected route of exposure for product in massive form.
Eye contact	Not an expected route of exposure for product in massive form.

Skin Contact Nickel or Cobalt containing alloys may cause sensitization by skin contact.

Ingestion Not an expected route of exposure for product in massive form.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Titanium 7440-32-6	> 5000 mg/kg bw	-	-
Aluminum 7429-90-5	15,900 mg/kg bw	-	> 1 mg/L
Molybdenum 7439-98-7	> 2000 mg/kg bw	> 2000 mg/kg bw	> 5.10 mg/L
Zirconium 7440-67-7	5000 mg/kg bw	-	>4.3 mg/L
Vanadium 7440-62-2	> 2000 mg/kg bw	-	-
Niobium (Columbium) 7440-03-1	-	> 2000 mg/kg bw	-
Chromium 7440-47-3	> 3400 mg/kg bw	-	> 5.41 mg/L
Tin 7440-31-5	> 2000 mg/kg bw	> 2000 mg/kg bw	> 4.75 mg/L
Iron 7439-89-6	98,600 mg/kg bw	-	> 0.25 mg/L
Copper 7440-50-8	481 mg/kg bw	>2000 mg/kg bw	>5.11 mg/L
Silicon 7440-21-3	> 5000 mg/kg bw	> 5000 mg/kg bw	> 2.08 mg/L
Nickel 7440-02-0	> 9000 mg/kg bw	-	-

Information on toxicological effects

Symptoms Nickel or Cobalt containing alloys may cause sensitization by skin contact.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Acute toxicity Product not classified.
Skin corrosion/irritation Product not classified.
Serious eye damage/eye irritation Product not classified.
Sensitization Nickel or Cobalt containing alloys may cause sensitization by skin contact.
Germ cell mutagenicity Product not classified.
Carcinogenicity Product not classified.

Chemical Name	ACGIH	IARC	NTP	OSHA
Chromium 7440-47-3		Group 3		
Nickel 7440-02-0		Group 1 Group 2B	Known Reasonably Anticipated	X

Reproductive toxicity Product not classified.
STOT - single exposure Product not classified.
STOT - repeated exposure Product not classified.
Aspiration hazard Product not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity

This product contains a chemical which is listed as a severe marine pollutant according to DOT

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Titanium 7440-32-6	The 72 h EC50 of titanium dioxide to	The 96 h LC50 of titanium dioxide to Cyprinodon	The 3 h EC50 of titanium dioxide for activated sludge	The 48 h EC50 of titanium dioxide to Daphnia Magna

	Pseudokirchnerella subcapitata was 61 mg of TiO2/L.	variegatus was greater than 10,000 mg of TiO2/L. The 96 h LC50 of titanium dioxide to Pimephales promelas was greater than 1,000 mg of TiO2/L .	were greater than 1000 mg/L.	was greater than 1000 mg of TiO2/L.
Aluminum 7429-90-5	The 96-h EC50 values for reduction of biomass of Pseudokirchneriella subcapitata in AAP-Medium at pH 6, 7, and 8 were estimated as 20.1, 5.4, and 150.6 µg/L, respectively, for dissolved Al.	The 96 h LC50 of aluminum to Oncorhynchus mykiss was 7.4 mg of Al/L at pH 6.5 and 14.6 mg of Al/L at pH 7.5	-	The 48-hr LC50 for Ceriodaphnia dubia exposed to Aluminium chloride increased from 0.72 to greater than 99.6 mg/L with water hardness increasing from 25 to 200 mg/L.
Molybdenum 7439-98-7	The 72 h EC50 of sodium molybdate dihydrate to Pseudokirchneriella subcapitata was 362.9 mg of Mo/L.	The 96 h LC50 of sodium molybdate dihydrate to Pimephales promelas was 644.2 mg/L	The 3 h EC50 of molybdenum trioxide for activated sludge was 820 mg/L.	The 48 h LC50 of sodium molybdate dihydrate to Ceriodaphnia dubia was 1,015 mg/L. The 48 h LC50 of sodium molybdate dihydrate to Daphnia magna was greater than 1,727.8 mg/L.
Chromium 7440-47-3	-	-	-	-
Niobium (Columbium) 7440-03-1	-	-	-	-
Vanadium 7440-62-2	The 72 h EC50 of vanadium pentoxide to Desmodesmus subspicatus was 2,907 ug of V/L.	The 96 h LC50 of vanadium pentoxide to Pimephales promelas was 1,850 ug of V/L .	The 3 h EC50 of sodium metavanadate for activated sludge was greater than 100 mg/L.	The 48 h EC50 of sodium vanadate to Daphnia magna was 2,661 ug of V/L.
Zirconium 7440-67-7	The 14 d NOEC of zirconium dichloride oxide to Chlorella vulgaris was greater than 102.5 mg of Zr/L.	The 96 h LL50 of zirconium to Danio rerio was greater than 74.03 mg/L.	-	The 48 h EC50 of zirconium dioxide to Daphnia magna was greater than 74.03 mg of Zr/L.
Tin 7440-31-5	The 72 h EC50 of tin chloride pentahydrate to Pseudokirchnerella subcapitata was 9,846 ug of Sn/L	The 7 d LOEC of tin chloride pentahydrate to Pimephales promelas was 827.9 ug of Sn/L	-	The 7 d LC50 of tin chloride pentahydrate to Ceriodaphnia dubia was greater than 3,200 ug of Sn/L.
Copper 7440-50-8	The 72 h EC50 values of copper chloride to Pseudokirchneriella subcapitata ranged between 30 µg/L (pH 7.02, hardness 250 mg/L CaCO3, DOC 1.95 mg/L) and 824 µg/L (pH 6.22, hardness 100 mg/L CaCO3, DOC 15.8 mg/L).	The 96-hr LC50 for Pimephales promelas exposed to Copper sulfate ranged from 256.2 to 38.4 ug/L with water hardness increasing from 45 to 255.7 mg/L.	The 24 h NOEC of copper chloride for activated sludge ranged from 0.32 to 0.64 mg of Cu/L.	The 48 h LC50 values for Daphnia magna exposed to copper in natural water ranged between 33.8 µg/L (pH 6.1, hardness 12.4 mg/L CaCO3, DOC 2.34 mg/L) and 792 µg/L (pH 7.35, hardness 139.7 mg/L CaCO3, DOC 22.8 mg/L).
Iron 7439-89-6	-	The 96 h LC50 of 50% iron oxide black in water to Danio rerio was greater than 10,000 mg/L.	The 3 h EC50 of iron oxide for activated sludge was greater than 10,000 mg/L.	The 48 h EC50 of iron oxide to Daphnia magna was greater than 100 mg/L.
Silicon 7440-21-3	The 72 h EC50 of sodium metasilicate pentahydrate to Pseudokirchnerella subcapitata was greater than 250 mg/L.	-	-	-
Nickel 7440-02-0	NOEC/EC10 values range from 12.3 µg/l for Scenedesmus accuminatus to 425 µg/l for Pseudokirchneriella subcapitata.	The 96h LC50s values range from 0.4 mg Ni/L for Pimephales promelas to 320 mg Ni/L for Brachydanio rerio.	The 30 min EC50 of nickel for activated sludge was 33 mg Ni/L.	The 48h LC50s values range from 0.013 mg Ni/L for Ceriodaphnia dubia to 4970 mg Ni/L for Daphnia magna.

Persistence and degradability

.

Bioaccumulation

.

Other adverse effects

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging None anticipated.

Chemical Name	RCRA - D Series Wastes
Chromium 7440-47-3	5.0 mg/L regulatory level

This product contains one or more substances that are listed with the State of California as a hazardous waste.

14. TRANSPORT INFORMATION

DOT Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies
ENCS	Complies
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

Chemical Name	CAS No.	Weight-%	SARA 313 - Threshold Values %
Chromium - 7440-47-3	7440-47-3	0 - 10	1.0

Copper - 7440-50-8	7440-50-8	0 - 5	1.0
Nickel - 7440-02-0	7440-02-0	0 - 0.9	0.1

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Chromium 7440-47-3		X	X	
Copper 7440-50-8		X	X	
Nickel 7440-02-0		X	X	

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Chemical Name	Hazardous Substances RQs
Chromium 7440-47-3	5000 lb
Copper 7440-50-8	5000 lb
Nickel 7440-02-0	100 lb

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals

Chemical Name	California Proposition 65
Nickel - 7440-02-0	Carcinogen

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Titanium 7440-32-6	X		
Aluminum 7429-90-5	X	X	X
Molybdenum 7439-98-7	X	X	X
Zirconium 7440-67-7	X	X	X
Vanadium 7440-62-2	X	X	X
Chromium 7440-47-3	X	X	X
Tin 7440-31-5	X	X	X
Copper 7440-50-8	X	X	X
Silicon 7440-21-3	X	X	X
Nickel	X	X	X

7440-02-0			

U.S. EPA Label Information
EPA Pesticide Registration Number Not applicable

16. OTHER INFORMATION

NFPA	**Health hazards** 0	**Flammability** 0	**Instability** 0	**Physical and Chemical Properties** -
HMIS	**Health hazards** 1*	**Flammability** 0	**Physical hazards** 0	**Personal protection** X

** = Chronic Health Hazard*

Issue Date 28-May-2015
Revision Date 13-Oct-2015
Revision Note
Updated Section 7

Note:
The information provided in this safety data sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of Safety Data Sheet

Additional information available from: Safety data sheets and labels available at ATImetals.com

Carbon, Alloy & Tool Steel Forgings

Safety Data Sheet

Section 1: Identification

Product Form: Mixture
Material Name: Carbon, Alloy & Tool Steel Forgings
Other Means of Identification: Alloy
CAS Number: Not applicable
Recommended use: Metal alloy for multiple production uses.

Manufacturer Information:

Finkl Steel
1355 E. 93rd Street
Chicago, IL 60619

Phone: (800) 621-1460
Emergency Phone Number: (773) 975-2510

Section 2: Hazards Identification

Classification

As sold, this product is not hazardous according to the criteria specified under the 29 CFR 1910.1200 Hazard Communication Standard, steel products are considered mixtures, due to further processing which may produce dust and or fumes.

Labeling

Not Applicable

Section 3: Composition/Information on Ingredients

Name	Product Identifier	Weight %
Aluminum	(CAS No) 7429-90-5	1.65 max
Carbon	(CAS No) 7440-44-0	0.01-1.60
Chromium	(CAS No) 7440-47-3	17.50 max
Copper	(CAS No) 7440-50-8	5.00 max
Iron	(CAS No) 7439-89-6	Balance
Manganese	(CAS No) 7439-96-5	2.00 max
Molybdenum	(CAS No) 7439-98-7	3.45 max
Nickel	(CAS No) 7440-02-0	5.50 max
Phosphorous	(CAS No) 7723-14-0	0.040 max
Silicon	(CAS No) 7440-21-3	1.80 max
Sulfur	(CAS No) 7704-34-9	0.15 max
Vanadium	(CAS No) 7440-32-6	1.50 max

NOTE: No permissible exposure limits (PEL) or threshold limit values (TLV) exist for steel. The above listing is a summary of elements used in alloying Finkl Steel Products. Various grades of steel will contain different combinations of these elements and/or trace materials. Exact specifications may be found by calling the facility and asking for additional information.

Section 4: First-Aid Measures

Eye Contact

Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation develops or persists.

Skin Contact

Wash the contaminated area with soap and water. Remove contaminated clothing and wash before reuse. If irritation develops, seek medical attention.

Ingestion

If swallowed, do NOT induce vomiting. Seek immediate medical attention.

Inhalation

Remove to fresh air. If respiratory irritation, dizziness, nausea, or unconscious occurs, seek immediate medical assistance.

Most Important Symptoms and effects, both acute and delayed

Excessive inhalation of metallic fumes and dust may result in: eye, nose and throat irritation, metallic taste in mouth, dryness and throat irritation, and chills. Fever indicates metal fume fever, lasts 12-48hrs. Chromium and Nickel have been identified as potential carcinogens.

Section 5: Fire-Fighting Measures

Extinguishing Media

Cover with sand or earth. Use extinguishing media appropriate for surrounding fire.

Unsuitable Extinguishing Media

DO NOT use water for fires involving molten metal.

Special Hazards Arising From the Substance or Mixture

Molten metal reacts violently with water. Heavily concentrated dust clouds of the material may be explosive.

Advice for Firefighters

Steel products in their natural state do not present a fire or explosion hazard. Do not breathe fumes from fires or vapors from decomposition. Firefighters must use full protective gear including NOISH approved positive-pressure self-contained breathing apparatus to protect against potential hazardous combustion and decomposition products.

Section 6: Accidental Release Measures

Personal Precautions

Avoid creating or spreading dust and wear protective equipment to prevent the contamination of skin, eyes, and clothing.

Emergency Procedures

Evacuate unnecessary personnel. Ventilate area. Eliminate ignition sources.

Environmental precautions

Prevent materials from entering drains, sewers, or waterways.

Methods and Materials Used for Containment

Contain and collect as any solid.

Cleanup Procedures

Avoid creating or spreading dust during clean up. Contain and collect as any solid. Collect in a suitable container for disposal.

Section 7: Handling and Storage

Precautions for Safe Handling

Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Avoid dust formation. Avoid contact with sharp edges or heated material.

Special Precautions

Use good housekeeping practices to prevent accumulation of dust and to keep airborne dust to a minimum. Avoid breathing metal fumes or dust.

Conditions for Safe Storage

Store in a dry, cool place. Keep container tightly closed.

Incompatible Materials

Avoid contact with strong acids.

Section 8: Exposure Controls/Personal Protection

Control Parameters

Components	CAS No.	OSHA-PEL (mg/m^3)	ACGIH-TLV (mg/m^3)
Aluminum	(7429-90-5)	15 as (Total Dust) 5 as (Respirable Dust)	10 Metal Dust as Al 5 Fume as Al
Carbon	(7440-44-0)	Not Listed	Not Listed
Chromium	(7440-47-3)	1.0 as Cr	0.5 as Cr
Copper	(7440-50-8)	0.2 as Cu; 1.0 as dust	0.2 as fume; 1.0 as dust
Iron	(7439-89-6)	10 ($Fe_2 0_3$ fume)	5 ($Fe_2 0_3$ fume)
Manganese	(7439-96-5)	5 as Mn	5 as dust; 1 as fume
Molybdenum	(7439-98-7)	15 as insoluble compds	10 as insoluble compds
Nickel	(7440-02-0)	1.0 as Ni	1.0 as Ni
Phosphorous	(7723-14-0)	.01 as P	.01 as P
Silicon	(7440-21-3)	15 as (Total Dust) 5 as (Respirable Dust)	10 Total dust
Sulfur	(7704-34-9)	5 sulfur dioxide	13 sulfur dioxide
Vanadium	(7440-32-6)	.05 dust; 0.1 fume	.05 dust & fume

Appropriate Engineering Controls

Provide general and/or local exhaust as necessary, to control airborne concentrations below exposure limits.

Personal Protective Equipment: Respiratory

If exposure limits are exceeded or irritation is experienced, NIOSH approved respiratory protection should be worn.

Personal Protective Equipment: Hands

Appropriate protective gloves should be worn when welding/burning and gloves while handling.

Personal Protective Equipment: Eyes

Wear safety glasses with side shields while grinding/cutting and face shield while welding, burning.

Personal Protective Equipment: Skin and Body

Use body protection appropriate for task. Good personal hygiene practices should always be followed.

Hygiene Measures

Do not breathe vapors/dust. When using, do not eat, drink or smoke. Provide regular cleaning equipment, work area and clothing. Wash hands before breaks and immediately after handling the product.

Section 9: Physical and Chemical Properties

Physical State:	Solid
Appearance	Wrought: Oxidized brown-black Machined: Metallic or grey-black, or painted
Odor:	Odorless
Odor Threshold:	No data available
pH:	No data available
Melting Point:	~2800 (°F)
Freezing Point	No data available
Boiling Point:	5400 (°F)
Flash Point:	No data available
Evaporation Rate:	No data available
Flammability (solid, gas):	No data available
Explosive Limits:	No data available
Vapor Pressure:	No data available
Vapor Density:	No data available
Relative density:	No data available
Solubility(ies):	No data available
Partition Coefficient:	No data available
Auto-ignition Temperature:	No data available
Decomposition Temperature:	No data available
Upper Flammability Limit (UFL):	No data available
Lower Flammability Limit (LFL):	No data available
Viscosity:	No data available
Specific Gravity:	7.6 – 7.8

Section 10: Stability and Reactivity

Reactivity

Product in natural state is not explosive but heavily concentrated dust clouds of the material may be explosive.

Stability

Product is stable.

Possibility of hazardous reactions

Hazardous polymerization will not occur.

Conditions to avoid

Non-vented areas when cutting, burning or brazing and generation of airborne dusts and fumes.

Incompatible Materials

Reacts with strong acid to form hydrogen gas.

Hazardous Decomposition Products

At temperatures above melting point, metallic oxide fumes may be liberated.

Section 11: Toxicological Information

Skin and Eye

Penetration of iron particles in the skin or eye may cause an exogenous or ocular siderosis which may be characterized by a red- pigmentation of the affected area. Ingestion overexposures to iron may affect the gastrointestinal, nervous, and hematopoietic system and the liver. Iron and steel founding, but not iron or iron oxide, has been listed as carcinogenic (Group 1) by IARC. This product may contain small amounts of nickel. Prolonged and repeated contact with nickel may cause sensitization dermatitis. This product may contain small amounts of vanadium. Allergic reactions resulting from skin and inhalation exposures have also been reported. Fumes or dust can cause severe eye irritation, and systemic effects. This product may contain small amounts of lead. Lead can accumulate in the body. Consequently, exposure to fumes or dust may produce signs of polyneuritis, diminished vision and peripheral neuropathy, such as tingling and loss of feeling in fingers, arms and legs.

Inhalation

When this product is welded, fumes are generated. Welding fumes may be different in composition from the original welding product, with the chief component being ordinary oxides of the metal being welded. Long-term exposure to iron dusts or fumes can result in a condition called siderosis which is considered to be a benign pneumoconiosis. Symptoms may include chronic bronchitis, emphysema, and shortness of breath upon exertion. Breathing fumes or dusts of this product may result in metal fume fever, which is an illness produced by inhaling metal oxides. These oxides are produced by heating various metals. This product may contain small amounts of manganese. Prolonged exposure to manganese dusts or fumes is associated with "manganism", a Parkinson-like syndrome characterized by a variety of neurological symptoms including muscle spasms, gait disturbances, tremors, and psychoses. This product may contain small amounts of cadmium. Primary target organs for cadmium overexposure are the lung and the kidney. Because of its cumulative nature, chronic cadmium poisoning can cause serious disease which takes many years to develop and may continue to progress despite cessation of exposure. Progression of the disease may not reflect current exposure conditions. It is also capable of causing a painful osteomalacia called "Itai-Itai" in postmenopausal women, and has caused developmental effects and/or reproductive effects in male and female animals. Cadmium is a listed carcinogen by NTP, OSHA, and IARC (Group 1). This product may contain small amounts of chromium. Prolonged and repeated overexposure to chromium dusts or fumes may cause skin ulcers, nasal irritation and ulceration, kidney damage and cancer of the respiratory system. Chromium is skin sensitizer. Cancer is generally attributed to the hexavalent (+6) form of chromium which is listed as a carcinogen by NTP and IARC (Group 1). Inhalation of nickel compounds has caused lung damage as well as sinus, nasal and lung cancer in laboratory animals. Nickel is a listed carcinogen by NTP and IARC (Group 1). This product may contain small amounts of vanadium. Adverse effects from dermal, inhalation or parenteral exposure to various vanadium compounds have been reported. The major target for vanadium pentoxide toxicity is the respiratory tract. Fumes or dust can cause severe respiratory irritation, and systemic effects. The product may contain small amounts of copper. Copper dust and fumes can irritate the eyes, nose and throat causing coughing, wheezing, nosebleeds, ulcers and metal fume fever. Other effects from repeated inhalation of copper fumes include a metallic or sweet taste, and discoloration of skin, teeth or hair. Copper also may cause an allergic skin reaction. Overexposure to copper can affect the liver.

Ingestion

Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms

In massive form, no hazards exist. Chronic health effects (including cancer) have been associated with the fumes and dusts of individual component metals (see above), and welding fumes as a general category have been listed by IARC as a carcinogen (Group 2B). There is also limited evidence that welding fumes may cause adverse reproductive and fetal effects. Evidence is stronger where welding materials contain known reproductive toxins, e.g., lead which may be present in the coating material of this product. This product may contain small amounts of vanadium. Chronic bronchitis, green tongue, conjunctivitis, pharyngitis, rhinitis, rales, chronic productive cough, and tightness of the chest have been

reported following overexposure. A statistical association between vanadium air levels and lung cancer has been suggested, but vanadium currently is not regarded as a human carcinogen. Lead is a known reproductive and developmental toxin. It is also associated with central nervous system disorders, anemia, kidney dysfunction and neurobehavioral abnormalities. The brain is a major target organ for lead exposure. Elemental lead is listed as an IARC 2B carcinogen.

Section 12: Transport Information

Special Precautions

Ensure that product is properly secured.

Section 16: Other Information

This SDS covers Finkl Steel product as delivered from the Finkl Steel facility, but does not include chemicals that may be applied by subsequent handlers and/or distributors of this product. This could include a variety of materials including oils, paints, galvanization, etc. that are not included in this SDS. Additionally, specialty orders may require application of coating material not listed in this SDS. SDSs for any Finkl-applied specialty coating will be provided separately. During welding, precautions should be taken for airborne contaminants that may originate from components of the welding rod. Arc or spark generated when welding or burning could be a source of ignition for combustible and/or flammable materials. The information in this Safety Data Sheet (SDS) was obtained from sources which we believe are reliable; however, the information is provided without any representation or warranty, expressed or implied, regarding the accuracy or correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of this product.

SAFETY DATA SHEET

CHEMARROW CORPORATION

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

ArrowLube 600

Cylinder Oil

AQMD Super Compliant

Chem Arrow Corporation
13643 Live Oak Lane
Irwindale, CA 91706
USA

Tel: +1-626-358-2255
Fax: +1-626-359-8190
www.chemarrow.com

Emergency Contact Information:
Chem Tel Inc.
Tel: 1-800-255-3924 (North America)
Tel: +1-813-248-0585 (all other countries)

SECTION 2: HAZARDS IDENTIFICATION

GHS Ratings:

Inhalation Toxicity	Acute Tox. 4	Gases>2500+<=5000ppm, Vapors>10+<=20mg/l, Dusts&mists>1+<=5mg/l

GHS Hazards

H332	Harmful if inhaled

GHS Precautions

P261	Avoid breathing dust/fume/gas/mist/vapours/spray
P271	Use only outdoors or in a well-ventilated area
P312	Call a POISON CENTER or doctor/physician if you feel unwell
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Warning

SECTION 3: COMPOSITION INFORMATION ON CLASSIFIED INGREDIENTS

Component/Chemical Name	CAS No.	Weight Concentration %
Residual oils, petroleum, solvent-dewaxed	64742-62-7	80.00% - 90.00%
Lubricating oils, petroleum, hydrotreated spent	64742-58-1	1.00% - 5.00%

Residual oils, petroleum, hydrotreated	64742-57-0	1.00% - 5.00%

The specific identity and exact concentration of any included proprietary ingredient is withheld as a trade secret.

SECTION 4: FIRST AID MEASURES

Inhalation: If inhalation occurs, move the exposed person to fresh air. Avoid further inhalation and seek medical attention.

Eye Contact: In case of eye contact, flush the eyes with water for fifteen (15) minutes. If contact lenses are worn, quickly remove them, then flush the eyes with water. If irritation develops seek medical attention.

Skin Contact: In case of skin contact, remove contaminated clothing. Flush the skin with large amounts of water, then wash the skin with soap and water. If redness or irritation develops, seek medical attention.

Ingestion: If material is ingested, seek immediate medical attention. If vomiting occurs spontaneously, keep the head below the hips to prevent aspiration of liquid into the lungs.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Haz Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide and other organic compounds will be evolved when the material undergoes combustion.

Fire Fighting Instructions: This material will burn. For fires involving this material, do not enter any enclosed or confined fire space without protective equipment including self-contained breathing apparatus.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do so without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Follow Local, State and Federal authority's regulations for reporting spills.

SECTION 7: HANDLING AND STORAGE

General Handling Information: Avoid contaminating soil or releasing this product into sewage, drainage system and bodies of water.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity or other sources of ignition. Empty containers should be completely drained, properly closed and promptly returned to a drum reconditioner or disposed of properly.

Storage Conditions: Store in dry indoor area, preferably under mild temperature conditions. Store in original packaging. Keep container tightly closed when not in use. Avoid freezing.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name / CAS No.	OSHA Exposure Limits	ACGIH Exposure Limits	Other Exposure Limits
Residual oils, petroleum, solvent-dewaxed 64742-62-7	PEL/TWA - 5 mg/m3 (8 hrs)	TLV/TWA - 5 mg/m3 (8 hrs) Form: Inhalable fraction	NIOSH REL/TWA - 5 mg/m3 (10 hrs) Form: Mist NIOSH REL/STEL - 10 mg/m3 (15 min) Form: Mist
Lubricating oils, petroleum, hydrotreated spent 64742-58-1	PEL/TWA - 5 mg/m3	TLV/TWA - 5 mg/m3 TLV/STEL 10 mg/m3	CAL OSHA TWA - 5mg/m3
Residual oils, petroleum, hydrotreated 64742-57-0	None reported	None reported	None reported

Engineering Controls: Use in a well ventilated area.

General Considerations: Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Attention: The data below are typical values and do not constitute a specification.

Appearance: Amber

Physical State: Liquid

Odor: Mild

pH: N/A

Vapor Pressure: Not determined

Odor Threshold: Unknown

Vapor Density: Not determined

Specific Gravity: 0.92

Viscosity SUS @ 100 F: 2000 +/- 200

Freezing Point: Not determined

Solubility in water: Oil

Boiling Range: N/A

Flash Point: 500 F,260 C

Evaporation Rate: N/A

Flammability: Unknown

Explosive Limits: 0%

Partition Coefficient (n-octanol/water): Unknown

Autoignition Temperature: N/A

Decomposition Temperature: Unknown

VOC (Concentrate) Grams/Liter: 17.98

SECTION 10: STABILITY AND REACTIVITY

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition Products: None known (None expected).

SECTION 11: TOXICOLOGICAL INFORMATION

Mixture Toxicity

Inhalation Toxicity LC50: 2mg/L

Component Toxicity (if applicable)

Carcinogenicity: The following chemicals comprise 0.1% or more of this mixture and are listed and/or classified as carcinogens or potential carcinogens by NTP, IARC, OSHA (mandatory listing), or ACGIH (optional listing).

CAS Number	Description	% Weight	Carcinogen Rating
None			No data found

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: No data has been established.

Ready Biodegradability: This material is not expected to be readily biodegradable.

Component Ecotoxicity

Residual oils, petroleum, solvent-dewaxed	96 Hr LC50 Oncorhynchus mykiss: >5000 mg/L 48 Hr EC50 Daphnia magna: >1000 mg/L
Lubricating oils, petroleum, hydrotreated spent	96 Hr LC50 Brachydanio rerio: 79.6 mg/L [semi-static]; 96 Hr LC50 Pimephales promelas: 3.2 mg/L [semi-static]

SECTION 13: DISPOSAL CONSIDERATION

Follow Local, State and Federal regulations regarding disposal.

SECTION 14: TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Agency	Proper Shipping Name	UN Number	Packing Group	Hazard Class
DOT	PETROLEUM OIL, N.O.I.B.N.; NOT REGULATED AS A HAZARDOUS MATERIAL UNDER 49 CFR.			
IATA	NOT REGULATED AS DANGEROUS GOODS			
IMDG	NOT REGULATED AS DANGEROUS GOODS			

SECTION 15: REGULATORY INFORMATION

Regulatory lists searched:

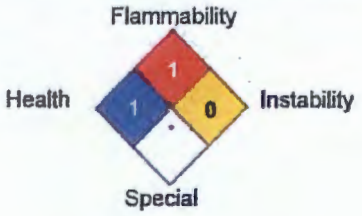
Country	Regulation	All Components Listed
US	California Prop 65	No
CA	Canada DSL	No
US	CERCLA	No
CN	China Inventory (IECSC)	Yes
EU	EINECS	Yes
MY	Malaysia Inventory (EHS Register)	No
US	SARA 311/312	No
US	TSCA	Yes

SECTION 16: OTHER INFORMATION

Hazardous Material Information System (HMIS)

HMIS & NFPA Hazard Rating Legend
*** = Chronic Health Hazard**
0 = INSIGNIFICANT
1 = SLIGHT
2 = MODERATE
3 = HIGH

National Fire Protection Association (NFPA)



Date Prepared: 5/28/15

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

NALCO

SAFETY DATA SHEET

PRODUCT

NexGuard® 22310

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NexGuard® 22310**

APPLICATION : BOILER WATER INTERNAL TREATMENT

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

CAUTION
May cause irritation with prolonged contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water. Use a mild soap if available.
Wear suitable protective clothing.
Not flammable or combustible. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. There may be irritation to the gastro-intestinal tract with nausea and vomiting.

INHALATION :
Not a likely route of exposure. Repeated or prolonged exposure may irritate the respiratory tract.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

HUMAN HEALTH HAZARDS - CHRONIC :
No adverse effects expected other than those mentioned above.

4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush with plenty of water for at least 15 minutes. If symptoms develop, seek medical advice.

SKIN CONTACT :
Flush with large amounts of water. Use soap if available. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
Not flammable or combustible. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Keep people away from and upwind of spill/leak. Ventilate spill area if possible.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Clean contaminated surfaces with water or aqueous cleaning agents. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Do not breathe vapors/gases/dust. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled.

STORAGE CONDITIONS :
Protect product from freezing. Store the containers tightly closed. Store in suitable labeled containers.

SUITABLE CONSTRUCTION MATERIAL :
PVC, Stainless Steel 304, EPDM, Buna-N, HDPE (high density polyethylene), Polyurethane, Neoprene, Polypropylene, Polyethylene, Stainless Steel 316L, 100% phenolic resin liner, Chlorosulfonated polyethylene rubber, Fluoroelastomer, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

UNSUITABLE CONSTRUCTION MATERIAL :
Brass, Mild steel, Epoxy phenolic resin

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :
Where concentrations in air may exceed the limits given in this section or when significant mists, vapors, aerosols, or dusts are generated, an approved air purifying respirator equipped with suitable filter cartridges is recommended. Consult the respirator / cartridge manufacturer data to verify the suitability of specific devices. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory

protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
When handling this product, the use of chemical gloves is recommended. The choice of work glove depends on work conditions and what chemicals are handled. Please contact the PPE manufacturer for advice on what type of glove material may be suitable. Gloves should be replaced immediately if signs of degradation are observed.

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear safety glasses with side-shields.

HYGIENE RECOMMENDATIONS :
Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Fluorescent Orange Yellow
ODOR	Normally None, however residual ammonia may be present in headspace of newly opened containers

SPECIFIC GRAVITY	1.19 @ 77 °F / 25 °C
DENSITY	9.9 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	10.5
FREEZING POINT	22 °F / -6 °C
VAPOR PRESSURE	Same as water
VOC CONTENT	0 % Calculated

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	7,070 mg/l	Product
Fathead Minnow	96 hrs	1,086 mg/l	Product
Inland Silverside	96 hrs	> 5,000 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	1,650 mg/l		Product
Mysid Shrimp (Mysidopsis bahia)	96 hrs	> 5,000 mg/l		Product

AQUATIC PLANT RESULTS :

Species	Exposure	EC50/LC50	Test Descriptor
Algae	72 hrs	10 mg/l	

PERSISTENCY AND DEGRADATION :

Total Organic Carbon (TOC) : 87,000 mg/l

Chemical Oxygen Demand (COD) : 240,000 mg/l

Biological Oxygen Demand (BOD) :

Incubation Period	Value	Test Descriptor
5 d	6,200 mg/l	Product

The organic portion of this preparation is expected to be poorly biodegradable.

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.
If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	30 - 50%	50 - 70%

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

CERCLA/SUPERFUND, 40 CFR 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives

The following limitations apply:

Maximum dosage	Limitation
1000 PPM	as product in the boilerwater

The polymer must not be used at pressures above 1,000 PSIG (6895 kPa).

NSF NON-FOOD COMPOUNDS REGISTRATION PROGRAM (former USDA List of Proprietary Substances & Non-Food Compounds) :
NSF Registration number for this product is : 121221
This product is acceptable for use in meat, poultry, and other food processing areas as a Boiler Treatment Product (G6), for treating boiler and steam lines where the steam produced may contact edible products. Acceptable usage shall be in accordance with the dosage limitations specified on the product label.

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product may contain trace levels (<0.1% for carcinogens, <1% all other substances) of the following substance(s) listed under the regulation. Additional components may be unintentionally present at trace levels.

Substance(s)	Citations
• Sodium Hydroxide	Sec. 311

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
This product may contain trace levels (<0.1% for carcinogens, <1% all other substances) of the following substance(s) listed under the regulation. Additional components may be unintentionally present at trace levels.

Substance(s)	Citations
• Acrylic Acid	Sec. 112

CALIFORNIA PROPOSITION 65 :
Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

Sodium Sulfate	7757-82-6

INTERNATIONAL CHEMICAL CONTROL LAWS :

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on the Inventory of Existing Chemical Substances China (IECSC).

EUROPE
The substance(s) in this preparation are included in or exempted from the EINECS or ELINCS inventories

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

KOREA
This product contains substance(s) which are not in compliance with the Toxic Chemical Control Law (TCCL) and may require additional review.

NEW ZEALAND
All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996,and are listed on or are exempt from the New Zealand Inventory of Chemicals.

PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

16. OTHER INFORMATION

Nalco Internal Number F105654

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight™ CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS™ CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS™ CD-ROM Version),
Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight™ CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH,
(TOMES CPS™ CD-ROM Version), Micromedex, Inc., Englewood, CO.

NALCO

SAFETY DATA SHEET

PRODUCT

NexGuard® 22310

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Ariel Insight™ (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight™ CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS™ CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 07/14/2010
Version Number : 2.1

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: SULFURIC ACID 93%
SDS NUMBER: CDS-2441

SDS DATE: 01/15/2015
ORIGINAL: 01/15/2015

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: SULFURIC ACID 93%
PRODUCT USES: Mineral Acid

COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

DANGER!!

2.1 HAZARD STATEMENTS: (CAT = Hazard Category)
(H200s) PHYSICAL: Corrosive To Metals:
H290 MAY BE CORROSIVE TO METALS.(CAT:1)
(H300s) HEALTH: Skin Corrosion/Irritation:
H314 CAUSES SEVERE SKIN BURNS AND EYE DAMAGE.(CAT:1)
(H300s) HEALTH: Acute Toxicity, Inhalation:
H332 HARMFUL IF INHALED.(CAT:4)

2.2 PRECAUTIONARY STATEMENTS:
EXPOSURE PREVENTION: AVOID ALL CONTACT!
PREVENT DISPERSION OF MISTS OR DUST!
P100s = General, P200s = Prevention,
P300s = Response, P400s = Storage, P500s = Disposal

P234	Keep only in original container.
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash hands thoroughly after handling.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P301+330+331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+361+353	IF ON SKIN (OR HAIR): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+340	IF INHALED: Remove victim to fresh air & keep at rest in a position comfortable for breathing.
P305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present & easy to do - Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P404	Store in a closed container.
P405	Store locked up.
P501	Dispose of contents/container to an approved waste disposal plant.

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

COMPANY IDENTITY: Univar
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SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Sulfuric Acid	7664-93-9	231-639-5	93
Water	7732-18-5	231-791-2	7

TRACE COMPONENTS: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SECTION 4. FIRST AID MEASURES

4.1 MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE & CHRONIC:
See Section 11 for symptoms/effects, acute & chronic.

4.2 GENERAL ADVICE:
First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists, refer to Section 8 for specific personal protective equipment.

4.3 EYE CONTACT:
If this product enters the eyes, check for and remove any contact lenses. Open eyes while under gently running water. Use sufficient force to open eyelids. "Roll" eyes to expose more surface. Minimum flushing is for 15 minutes. Seek immediate medical attention.

4.4 SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

4.5 INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). Seek immediate medical attention.

4.6 SWALLOWING:
If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, give two glasses of water to drink. DO NOT INDUCE VOMITING. Never induce vomiting or give liquids to someone who is unconscious, having convulsions, or unable to swallow. Seek immediate medical attention.

4.7 RESCUERS: Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and SDS to physician or health professional with victim.

4.8 NOTES TO PHYSICIAN:
There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Any material aspirated during vomiting may cause lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be done by means least likely to cause aspiration (such as: Gastric lavage after endotracheal intubation).

SECTION 5. FIRE FIGHTING MEASURES

5.1 FIRE & EXPLOSION PREVENTIVE MEASURES:
Isolate from alkalies, oxidizers, organics, extreme heat and open flames.

5.2 SUITABLE (& UNSUITABLE) EXTINGUISHING MEDIA:
Use extinguishing agent appropriate for surrounding fire.

5.3 SPECIAL PROTECTIVE EQUIPMENT & PRECAUTIONS FOR FIRE FIGHTERS:
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).

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SECTION 5. FIRE FIGHTING MEASURES (CONTINUED)

5.4 SPECIFIC HAZARDS OF CHEMICAL & HAZARDOUS COMBUSTION PRODUCTS:
SLIGHTLY COMBUSTIBLE!
Reacts with most metals producing hydrogen which is extremely flammable & may explode. Keep container tightly closed. Isolate from oxidizers, alkalis, heat, & open flame. Applying to hot surfaces requires special precautions. Closed containers may explode if exposed to extreme heat. Continue all label precautions!

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent additional discharge of material, if possible to do so without hazard. For large spillse, implement cleanup procedures and, if in public area, advise authorities.

6.2 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, EMERGENCY PROCEDURES:
The proper personal protective equipment for incidental releases (such as: 1 Liter of the product released in a well-ventilated area), use impermeable gloves, they should be Level B: **triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus** specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat. Self-Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

6.3 ENVIRONMENTAL PRECAUTIONS:
Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.

6.4 METHODS AND MATERIAL FOR CONTAINMENT & CLEAN-UP:
Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).

SECTION 7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:
Isolate from oxidizers, alkalis, heat, & open flame. Use only with adequate ventilation. Do not get in eyes, on skin or clothing. Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. Continue all label precautions! NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:
Keep separated from strong oxidants, strong bases, combustible & reducing substances, metals, food & feedstuffs, incompatible materials. May be stored in stainless steel containers. See: Section 10, <Materials to Avoid>. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage. Reacts with most metals producing hydrogen which is extremely flammable & may explode. Wear full face shield, gloves & full protective clothing when opening or handling. When empty, drain completely, replace bungs securely.

7.3 NONBULK: CONTAINERS:
Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: SULFURIC ACID 93%
SDS NUMBER: CDS-2441

SDS DATE: 01/15/2015
ORIGINAL: 01/15/2015

SECTION 7. HANDLING AND STORAGE (CONTINUED)

7.4 BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

7.5 TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

7.6 PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

7.7 EMPTY CONTAINER WARNING:
Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY BURST AND CAUSE INJURY OR DEATH.**

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 EXPOSURE LIMITS:

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)	IDLH (NIOSH)
Sulfuric Acid	7664-93-9	231-639-5	1.0 mg/m^3	1.0 mg/m^3	15 mg/m^3
Water	7732-18-5	231-791-2	None Known	None Known	

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

8.2 APPROPRIATE ENGINEERING CONTROLS:

RESPIRATORY EXPOSURE CONTROLS
Airborne concentrations should be kept to lowest levels possible. If vapor, dust or mist is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air-supplied respirator authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State regulations, after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown. Maintain airborne contaminant concentrations below exposure limits. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For particulates, a particulate respirator (NIOSH Type N95 or better filters) may be worn. If oil particles (such as: lubricants, cutting fluids, glycerine, and so on) are present, use a NIOSH Type R or P filter. For a higher level of protection, use positive pressure supplied air respiration protection or Self-Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS
Positive pressure, full-face piece Self-Contained Breathing Apparatus; or positive pressure, full-face piece Self-Contained Breathing Apparatus with an auxilliary positive pressure Self-Contained Breathing Apparatus.

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SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Necessary
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

8.3 INDIVIDUAL PROTECTION MEASURES, SUCH AS PERSONAL PROTECTIVE EQUIPMENT:

EYE PROTECTION:
Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If contact is possible, chemical splash goggles should be worn, when a higher degree of protection is necessary, use splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:
Use gloves chemically resistant to this material. Preferred examples: Butyl rubber, Chlorinated Polyethylene, Polyethylene, Ethyl vinyl alcohol laminate ("EVAL"), Polyvinyl alcohol ("PVA"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"), Neoprene, Nitrile/butadiene rubber ("nitril") or ("NBR"), Polyvinyl chloride ("PVC") or "vinyl"), Viton. Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check durirg use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

WORK & HYGIENIC PRACTICES:
Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using toilet facilities and at the end of the working period. Provide readily accessible eye wash stations & safety showers. Remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Oily Liquid, Water-White to slightly yelloow
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	< 1
MELTING POINT/FREEZING POINT:	-29 C / -20 F
BOILING RANGE (IBP,Dry Point):	276 to 281 C / 528 to 538 F
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-Butyl Acetate=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Noncombustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	10.0 (Lowest Component)
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	< 0.3
VAPOR DENSITY (air=1):	3.4
GRAVITY @ 68/68F / 20/20C:	
DENSITY:	1.830
SPECIFIC GRAVITY (Water=1):	1.835
POUNDS/GALLON:	15.3
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOCs (>0.044 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0
VISCOSITY @ 100 C (ASTM D445) 514.0	
VISCOSITY @ 20 C (ASTM D445):	Not Available

* Using CARB (California Air Resources Board Rules).

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SECTION 10. STABILITY & REACTIVITY

10.1 REACTIVITY & CHEMICAL STABILITY:
Stable under normal conditions, but Reacts with most metals producing hydrogen which is extremely flammable & may explode.

10.2 POSSIBILITY OF HAZARDOUS REACTIONS & CONDITIONS TO AVOID:
Isolate from sources of ignition, heat, & open flame. Reacts vigorously with water.

10.3 INCOMPATIBLE MATERIALS:
The substance is a strong acid, reacts violently with bases and is corrosive. Upon heating, irritating and toxic fumes are formed including sulfur oxides. The substance is a strong oxidant & reacts violently with combustible & reducing materials. Corrosive to most common metals, forming flammable/explosive gas (hydrogen). Sulfuric acid reacts violently with water & organic materials with much heat. Hazardous gases are evolved on contact with chemicals such as cyanides, sulfides, and carbides.

10.4 HAZARDOUS DECOMPOSITION PRODUCTS:
Upon heating, irritating and toxic fumes are formed including sulfur oxides.

10.5 HAZARDOUS POLYMERIZATION:
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 ACUTE HAZARDS

11.11 EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Animal testing indicates this material is corrosive to the eye.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause severe skin & eye burns. Wash thoroughly after handling.

11.12 INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful.

11.13 SWALLOWING:
Harmful or fatal if swallowed.

11.2 SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
Pre-existing disorders of any target organs mentioned in this Document can be aggravated by over-exposure by routes of entry to components of this product. Persons with these disorders should avoid use of this product.

11.3 CHRONIC HAZARDS

11.31 CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
PROVEN Carcinogen, Human, Group 1 (IARC), SUSPECTED Carcinogen, Human, Group A2 (ACGIH).

11.32 TARGET ORGANS: May cause damage to target organs, based on animal data.

11.33 IRRITANCY: Irritating to contaminated tissue.

11.34 SENSITIZATION: No component is known as a sensitizer.

11.35 MUTAGENICITY: No known reports of mutagenic effects in humans.

11.36 EMBRYOTOXICITY: No known reports of embryotoxic effects in humans.

11.37 TERATOGENICITY: No known reports of teratogenic effects in humans.

11.38 REPRODUCTIVE TOXICITY: No known reports of reproductive effects in humans.

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SECTION 11. TOXICOLOGICAL INFORMATION (CONTINUED)

A MUTAGEN is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate across generational lines. An EMBRYOTOXIN is a chemical which causes damage to a developing embryo (such as: within the first 8 weeks of pregnancy in humans), but the damage does not propagate across generational lines. A TERATOGEN is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A REPRODUCTIVE TOXIN is any substance which interferes in any way with the reproductive process.

11.4 MAMMALIAN TOXICITY INFORMATION

LD50 (Oral, Acute): 2140 mg/kg (Rat)
LC50 / 2 hours: 510 mg/m^3 (Rat), 320 mg/m^3 (Mouse)

SECTION 12. ECOLOGICAL INFORMATION

12.1 ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.2 EFFECT OF MATERIAL ON PLANTS AND ANIMALS:
This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

12.3 EFFECT OF MATERIAL ON AQUATIC LIFE:
The substance is harmful to aquatic organisms.
LC50 / 48 hours: 49 mg/L, Tap Water, 20 C (Bluegill sunfish)
LC50 / 48 hours: 100 - 330 mg/L, Aerated Water (Flounder)

12.4 MOBILITY IN SOIL
Mobility of this material has not been determined.

12.5 DEGRADABILITY
This product is completely biodegradable.

12.6 ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.
ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCAL REGULATIONS. IF IN DOUBT, CONTACT PROPER AGENCIES. EPA CHARACTERISTIC: D002

SECTION 14. TRANSPORT INFORMATION

MARINE POLLUTANT: No
DOT/TDG SHIP NAME: UN1830, Sulfuric acid, 8, PG-II
DRUM LABEL: (CORROSIVE)
IATA / ICAO: UN1830, Sulfuric acid, 8, PG-II
IMO / IMDG: UN1830, Sulfuric acid, 8, PG-II
EMERGENCY RESPONSE GUIDEBOOK NUMBER: 137

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SECTION 15. REGULATORY INFORMATION

15.1 EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health, Chronic Health, Reactivity

All components of this product are on the TSCA list.
SARA Title III Section 313 Supplier Notification
This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
*Sulfuric Acid	7664-93-9	231-639-5	93	(302,311,312,313)	1000

15.2 STATE REGULATIONS:
CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

15.3 INTERNATIONAL REGULATIONS
The identified components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL or NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

15.4 CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.
E: Corrosive Material.

This product was classified using the hazard criteria of the Controlled Products Regulations (CPR). This Document contains all information required by the CPR.

SECTION 16. OTHER INFORMATION

16.1 HAZARD RATINGS:
HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, PHYSICAL HAZARD: 2
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

16.2 EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

16.3 SDS DATE: 01/15/2015

Exhibit 2

N

LEGEND

- Storm Water Sump/Pump
- Drain Inlet Filter Inset (Installed April 2017)
- Discharge Point
- Storm Water Trench Drain
- EnviroSoxx Filter Sock Location
- Storm Water Conveyance to DP5
- Storm Water Flow Direction
- Clarifier (Sanitary Sewer)
- A — Hazardous Materials Storage Area
- B — Satellite Hazardous Waste Accumulation Area
- Industrial Activity Area
- Propane
- Process Water Trench
- Unpaved Area
- Waste Water Treatment

Note

Aerial photo provided by Esri, 2015.

Feet
0 40 80

Projectad Coordinate System
Datum: NAD 83
State Plane California Zone V
Units: Feet

GSI ENVIRONMENTAL

SITE MAP

Arcturus Manufacturing Corporation
6001 Arcturus Avenue, Oxnard, California

GSI Job No.	4499	Drawn By:	AV
Issued:	6-Jun-2017	Chk'd By:	ME
Map ID:	Arcturus_SiteMap	Appv'd By:	MQL

FIGURE 2